THE UNIVERSITY OF ALBERTA

RELEASE FORM

DONALD GEORGE HORNER

INCOME DISTRIBUTION IN ALBERTA AGRICULTURE

MASTER OF ARTS

1975

...May 7, 1975...........

THE UNIVERSITY OF ALBERTA

INCOME DISTRIBUTION IN ALBERTA AGRICULTURE

BY

© DONALD GEORGE HORNER

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE

OF MASTER OF ARTS

DEPARTMENT OF ECONOMICS

EDMONTON, ALBERTA

SPRING 1975

THE UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled Income Distribution in Alberta Agriculture, submitted by Donald George Horner, in partial fulfillment of the requirements for the degree of Master of Arts.

Date. May 5, 1975

ABSTRACT

This study measures, within the context of a social welfare approach to agricultural policy development, the level and, in particular, the distribution of 1970 Alberta farm income, within and among the census divisions.

The role of the personal distribution of income in welfare economics theory is examined in an historical perspective in order to determine the applicability of welfare economics in the derivation of statistical measures of income distribution. The conclusion is that the personal distribution of income has never explicitly been incorporated into the theory of social welfare. As a result, welfare economics is of limited value with respect to the actual quantification of income distribution. Accordingly, it is necessary to use the traditional measures of income inequality. The statistic which is primarily used in this study is the Gini coefficient. The rankings of census divisions provided by this statistic are compared to the rankings of census divisions provided by alternative measures of income inequality. The choice of the Gini coefficient is based on certain welfare considerations.

A number of different estimates of farm income are made on the basis of 1971 Census of Agriculture data and Statistics Canada net farm income estimates for 1970. Analysis of the distribution of farm income among census divisions is made on a comparative basis using average farm income levels. With respect to the distribution of farm income

within census divisions, comparative analysis is made using Gini coefficients. The conclusions of this study are that wide income disparities existed in Alberta agriculture in 1970. In particular gross farm incomes were relatively lower and more equally distributed in the northern census divisions than in the south. Net farm cash incomes were not only lower but also less equally distributed in the northern census divisions than those in the south. However, when off-farm labour income was included in net farm income estimates the northern census divisions exhibited lower and more equally distributed farm incomes than southern census divisions.

The recommendations of this study are that continued study should be made of the distribution of farm income, including the identification of socio-economic and physical variables which influence farm income distribution; that more emphasis should be directed to the collection of complete and reliable data on the distribution of farm income; and that more emphasis should be placed on the explicit incorporation of distributional criteria in policy analysis.

ACKNOWLEDGEMENTS

This study was financially supported by the Alberta Department of Agriculture for which I wish to express my thanks. I would also like to express my deepest appreciation to my supervisors, Michele M. Veeman and Terry S. Veeman, for their tremendous help and guidance in all phases of the study. Thanks also go to Travis Manning and Jim Wiebe for their valuable comments, and to Ron Bence, graphic artist, and Jim Copeland, computer analyst, for their assistance. My appreciation also goes to Maggi Antone, typist, for her long hours of careful work. Finally, my deepest gratitude goes to my wife Barbara for her assistance in computer programming, proofreading and editing, and for her general support and encouragement throughout and always.

TABLE OF CONTENTS

CHAPTER		PAGE
I.	INTRODUCTION	1
	The Problem	1
	The Nature and Scope of the Study	2
II.	WELFARE ECONOMICS AND THE DISTRIBUTION OF INCOME	8
	Walras and Pareto	9
	Pigou	19
	Modern Approaches to General Optimization	24
	Income Distribution and Welfare Theory: Summary	32
III.	THE MEASUREMENT OF INCOME DISTRIBUTION	34
	The Optimal Distribution of Income	34
	Some Common Measures of Income Inequality	47
	Summary	55
IV.	THE ESTIMATION OF 1970 ALBERTA FARM INCOME	57
	Census Data Problems	57
	The Estimation of Farm Income	59
	Remaining Data	68
	Summary	68
V.	ALBERTA FARM INCOME INEQUALITY IN 1970	70
	The Definition of Income	70
	The Measures of Income Inequality	71
	The Gini Coefficient and Other Measures of Inequality	90
	The Results	91
	General Conclusions	119

CHAPTER		PAGE
VI.	CONCLUSIONS AND RECOMMENDATIONS	123
	Conclusions	123
	Recommendations	133

* * *

SELECTED BIBLIOGRAPHY	140
APPENDIX A	143
APPENDIX B	176

LIST OF TABLES

TABLE		PAGE
3.1	An Hypothetical Personal Distribution of Income	42
5.1	Summary Measures of the 1970 Distribution of Income in Alberta by Census Division and Definition of Farm Income	74
5.2	Rankings of Census Divisions from Most Equal Distribution of Income to Least Equal by Measure of Inequality and Definition of Farm Income	82
5.3	Spearman Rank Order Coefficients	92
5.4	Rankings of Census Divisions from Most Equal Income Distribution to Least Equal for the Purpose of Comparative Analysis, by Definition of Farm Income	93
5.5	Rankings of Census Divisions by Average Income Levels from High to Low and by Definition of Farm Income	101
5.6	Gini Coefficients Describing Particular Lorenz Relationships, by Census Division	110
5.7	Proportions of Selected Component Incomes to Selected Base Incomes	113

* * *

A.1	Basic Data by Economic Class and Census Division	144
A.2	Averaged Basic Data by Economic Class and Census Division	160
A.3	Paired Cumulative Distributions of Basic Data Classified by Economic Groups Ranked According to Average (Low to High) and by Census Division	168
B.1	Selected Economic Characteristics of Census Farms by Economic Class and Census Division	177
B.2	Selected Economic Characteristics of Census Farms by Census Division	192

LIST OF FIGURES

FIGURE		PAGE
1.1	The 1971 Census of Agriculture Alberta Census Divisions	3
2.1	Pareto Exchange Equilibrium	13
2.2	The Effect of Income Distribution in Social Welfare Analysis	23
2.3	Distribution as a Relevant Consideration in the Theory at Social Welfare Maximization	28
3.1	Identical Concave Individual Utility Functions	36
3.2	Identical Linear Individual Utility Functions	36
3.3	Non-Identical Linear Individual Utility Functions	37
3.4	Non-Identical Concave Individual Utility Functions	37
3.5	A Lorenz Curve Constructed from Data in Table 3.1	43
3.6	Intersecting Lorenz Curves	46
5.1	The Case of Negative Net Farm Cash Incomes in Census Division Six	72
5.2	Average Levels of Farm Income and Levels of Equality of the Distribution of Farm Income (Gross Farm Cash Income--Gross Farm Cash Income Plus Income in Kind)	95
5.3	Average Levels of Farm Income and Levels of Equality of the Distribution of Farm Income (Gross Farm Cash Income Plus Off-Farm Labour Income--Gross Farm Cash Income Plus Off-Farm Labour Income Plus Income in Kind)	96
5.4	Average Levels of Farm Income and Levels of Equality of the Distribution of Farm Income (Net Farm Cash Income)	97

FIGURES PAGE

5.5	Average Levels of Farm Income and Levels of Equality of the Distribution of Farm Income (Net Farm Cash Income Plus Income in Kind)	98
5.6	Average Levels of Farm Income and Levels of Equality of the Distribution of Farm Income (Net Farm Cash Income Plus Off-Farm Labour Income)	99
5.7	Average Levels of Farm Income and Levels of Equality of the Distribution of Farm Income (Net Farm Cash Income Plus Off-Farm Labour Income Plus Income in Kind)	100
5.8	Agricultural Production by Product Type by Census Division	104
5.9	An Hypothetical Relationship Describing Off-Farm Labour Income as a Function of Gross Farm Income	108

CHAPTER I

INTRODUCTION

The Problem

An area frequently neglected in economics is the study of the personal distribution of income. This is due firstly, to the difficult nature of accomodating concepts of social welfare within the framework of orthodox economic theory and secondly, to the inability of economists to rigorously incorporate distribution into the theory of social welfare. As a result, the tendency is for economists to emphasize considerations of efficiency at the expense of distribution. Since distributional considerations are frequently considered of either negligible importance or of an impossible nature to cope with, little attention is given to the actual quantification of income distributions. It therefore appears, within the context of policy formation, that decision makers frequently have little distributional information on which to base distribution-relevant policy decisions.

Problems of relatively low and unequally distributed farm incomes have frequently characterized the Canadian agricultural industry. This study focuses on the 1970 level and

distribution of farm income in the province of Alberta.

The average level of gross farm cash income which accrued to Alberta farm operators in 1970 was $12,137, while the average level of net farm cash income was only $2,446. Among the fifteen census divisions illustrated in Figure 1.1, average gross farm cash income varied from a high of $27,089 in census division two to a low of $4,454 in census division fourteen. Average net farm cash incomes varied from a high of $8,016 in census division two to a low of $-1,399 in census division nine. Moreover, this study shows that in 1970, 20.73 percent of all farm operators in Alberta earned only 1.89 percent of total gross farm cash income. In terms of net farm cash income, 38.27 percent of all operators showed net farm losses for 1970 while only 3.81 percent of all operators earned 66.31 percent of total net farm cash income.[1] These figures illustrate the severe disparity of farm incomes in Alberta which prevailed in 1970. The purpose of this study is to measure, within the context of a welfare economics approach to agricultural policy development, the level, and in particular, the distribution of 1970 Alberta farm income within and among the fifteen census divisions.

The Nature and Scope of the Study

This study was undertaken under the sponsorship of the Alberta Department of Agriculture. It focuses on the level

---

[1]These figures are derived using the methods presented in Chapter IV.

FIGURE 1.1

THE 1971 CENSUS OF AGRICULTURE
ALBERTA CENSUS DIVISIONS

and distribution of 1970 farm income in Alberta.

In order to estimate the overall income positions of Alberta farm operators in 1970, it is desirable to include in estimates of total income additional sources of income such as income in kind, off-farm labour income, business income, pension income and investment income; and to compute the impact of the inclusion of each on the level and distribution of farm income. Also desirable is consideration of "net worth" or net asset accumulation. The latter would enable measurement of the level and distribution of farm "wealth", which may be a better indicator of the welfare positions of farm operators. However, lack of sufficient data were encountered with respect to business income, pension income, investment income, and net worth valuations. The data available for income in kind and off-farm labour income was incorporated into the analysis and the impacts of the inclusion of each on the level and distribution of income quantified. The data on gross farm cash income, farm expenses, income in kind, and off-farm labour income were compiled from the 1971 Census of Agriculture,[1] Statistics Canada net farm income estimates,[2] and a number of supplementary sources.

The choice of a measure of the distribution of income is a difficult matter. Ideally, the chosen measure should

---

[1]Statistics Canada, <u>1971 Census of Canada</u>, Vol.IV, <u>Agriculture</u>, Part 3, Alberta.

[2]Statistics Canada, Agriculture Division, <u>Net Farm Income 1972</u>, Cat. No. 21-202 (Ottawa: Statistics Canada, June, 1973).

quantify the distribution of income in terms of the level of social welfare. This requires rigorous specification of the social welfare function. However, the relationship between the level of social welfare and the personal distribution of income has not been firmly established. Indeed, only recently has the question of distribution been raised within the context of welfare economics theory. This study examines the role of the personal distribution of income in the theory of social welfare from an historical perspective, and the extent to which welfare economics may be applied in the derivation of measures of income distribution. The conclusion is that in lieu of a statistical device to measure the distribution of income which can be derived from the social welfare function, it is necessary to turn to the common descriptive measures of inequality. The choice of this measure is based on an examination of some welfare implications of each of the proposed measures of inequality.

The level of inequality within each of the fifteen census divisions and for the province as a whole is quantified with respect to five different measures of inequality including the Gini coefficient, the relative mean deviation, the variance, the coefficient of variation and the standard deviation of logarithms. A comparison of the rankings of census divisions by each of the measures indicated that substantial ranking discrepancies exist among the measures. Since the Gini coefficient is considered in a welfare sense "superior" to the other measures, the ranking of census divi-

sions chosen for the purpose of comparative analysis is the one determined by that statistic. This study indicates that substantial differences in farm income levels in 1970 existed within and among the Alberta census divisions, and that the extent of these differences is dependent upon the definition of farm income used in the analysis. Regardless of the definition of farm income, however, the problem of relatively low and unequally distributed incomes in Alberta appeared to be serious.

In Chapters II and III of this study is examined the incorporation of income distribution into welfare economics theory and the derivation of measures by which the personal distribution of income may be quantitatively measured. In Chapter IV is a discussion of the data and the techniques of estimation of Alberta farm income. The presentation of the empirical results and a comparative analysis of these results are presented in Chapter V. A number of hypotheses which may explain the nature of the observed distributions but which remain to be tested are also discussed in Chapter V. Finally, in Chapter VI are presented the conclusions of the study and a number of recommendations.

This study indicates that serious distributional inequities of farm income were characteristic of the 1970 Alberta agricultural economy. Although the agricultural situation in 1975 has in many ways changed substantially since 1970, it is likely the case that serious--and perhaps aggravated--distributional problems still remain. Continuing

study of the distribution of farm income in Alberta is warranted as is the further identification and statistical testing of those socio-economic and physical factors which may be associated with particular distributional patterns and any changing trends in these.

CHAPTER II

WELFARE ECONOMICS AND THE DISTRIBUTION OF INCOME

Orthodox economic thought has typically emphasized the concept of optimization of certain economic variables. It is not surprising to find, therefore, that welfare economics, the branch of economics dealing with social as opposed to individual welfare, is concerned with the derivation of conditions required for the maximization of total social welfare. Since the level of social welfare is a reflection of the welfare conditions of the individual members of a society, then some relationship exists between the level and distribution of individual welfares and the level of state welfare. Further, since individual welfare is hypothesized to be dependent upon individual income, some relationship exists between the level and distribution of individual incomes and total social welfare. The pursuit of general welfare optimizing conditions, however, has traditionally concentrated on the conditions required to maximize total social economic output, with little or no emphasis on the distribution of output. The thrust of welfare economic theory has thus been placed upon efficiency or production

criteria, with distributional considerations generally entering independently of the optimizing conditions. The "dualistic approach",[1] as Dobb has termed it, is not without problem. The "separation of production from distribution in the course of postulating conditions most conducive to economic welfare....has dogged all the various attempts to formulate a unique General Optimum".[2]

Walras and Pareto

The first rigorous attempt to formulate the conditions required to maximize the total utility of all parties concerned in a production and exchange economy was made by Léon Walras.[3] After setting out in mathematical detail his general equilibrium equations of production and exchange, he proposed that "freedom procures, within certain limits, the maximum of utility; and since the factors which interfere with freedom are obstacles to the attainment of this maximum, they should without exception, be eliminated as completely as possible".[4] Thus, Walras emphasized that under most circumstances free competition should be the rule of practical policy--the justification for such policy lying in the maximization of utility. He recognized, however, that the

---

[1] Maurice Dobb, Welfare Economics and the Economics of Socialism (Cambridge: Cambridge University Press, 1969), p.27.

[2] Ibid.

[3] Léon Walras, Elements of Pure Economics, trans. William Jaffé (Homewood, Ill.: Richard D. Irwin, Inc. for the American Economic Association and the Royal Economic Society, 1954).

[4] Ibid., p.256.

principle has limits of applicability and accordingly qualified it on two grounds. In the first place, he distinguished between "private utility which the individual is capable of estimating and social wants or public utility which is estimated in an entirely different way."[1] He concluded that the principle of free competition is not applicable to cases in which the public interest is concerned. Secondly, Walras was careful not to equate utility with the question of justice, recognizing that the original distribution of income is of fundamental significance. "Though our description of free competition emphasizes the problem of utility, it leaves the question of justice entirely to one side, since our sole object has been to show how a certain distribution of services gives rise to a certain distribution of products."[2] Together, the two qualifications implicitly deny the synonymity of Walrasian utility maximization--in a local sense--and maximization of total social utility--in a global sense. Although Walras failed to explicitly recognize the difference, it appears that in the light of the qualifications which he made, he was in fact aware of the distinction. Thus, at one point, he critically asked if there are not yet economists "who, not content with exaggerating the applicability of laissez-faire, laissez-passer to industry, even extend it to the completely

---

[1] Ibid., p.256.
[2] Ibid., p.257.

extraneous question of property?"[1] Walras chose not to press the issue further, however, and instead left the dichotomy of which he was at least aware, unchallenged. As a result, his exercise yields no more than the necessary condition for a local maximization of utility, conditional upon the original distribution; and in no sense qualifies as an unreserved optimum from a social welfare standpoint. His treatment of the distribution of income as extraneous to the analysis thereby invalidates any claim to a theory of a general optimum.

Walras' analysis was further developed by his successor to the Chair of Political Economy at Lausanne, Vilfredo Pareto. Using Edgeworth's indifference curves, Pareto was able to transform the original discussion into an ordinal content by showing that a position of equilibrium in exchange is reached when tangency between the indifference curves of the individuals concerned and the price or exchange line occurs. Thus, "the members of a collectivity enjoy maximum ophelimity in a certain position when it is impossible to find a way of moving from that position very slightly in such a manner that the ophelimity enjoyed by each of the individuals of that collectivity increases or decreases."[2]

That such a point--a Pareto optimum or point of utility[3] maximization--does not define a unique general opti-

---

[1] Ibid.

[2] Vilfredo Pareto, Manual of Political Economy, ed. Ann S. Schwier and Alfred N. Page, trans. Ann S. Schwier (New York: Augustus M. Kelley, 1971), p.261.

[3] Pareto designated the more familiar term, economic utility, by the word ophelimity.

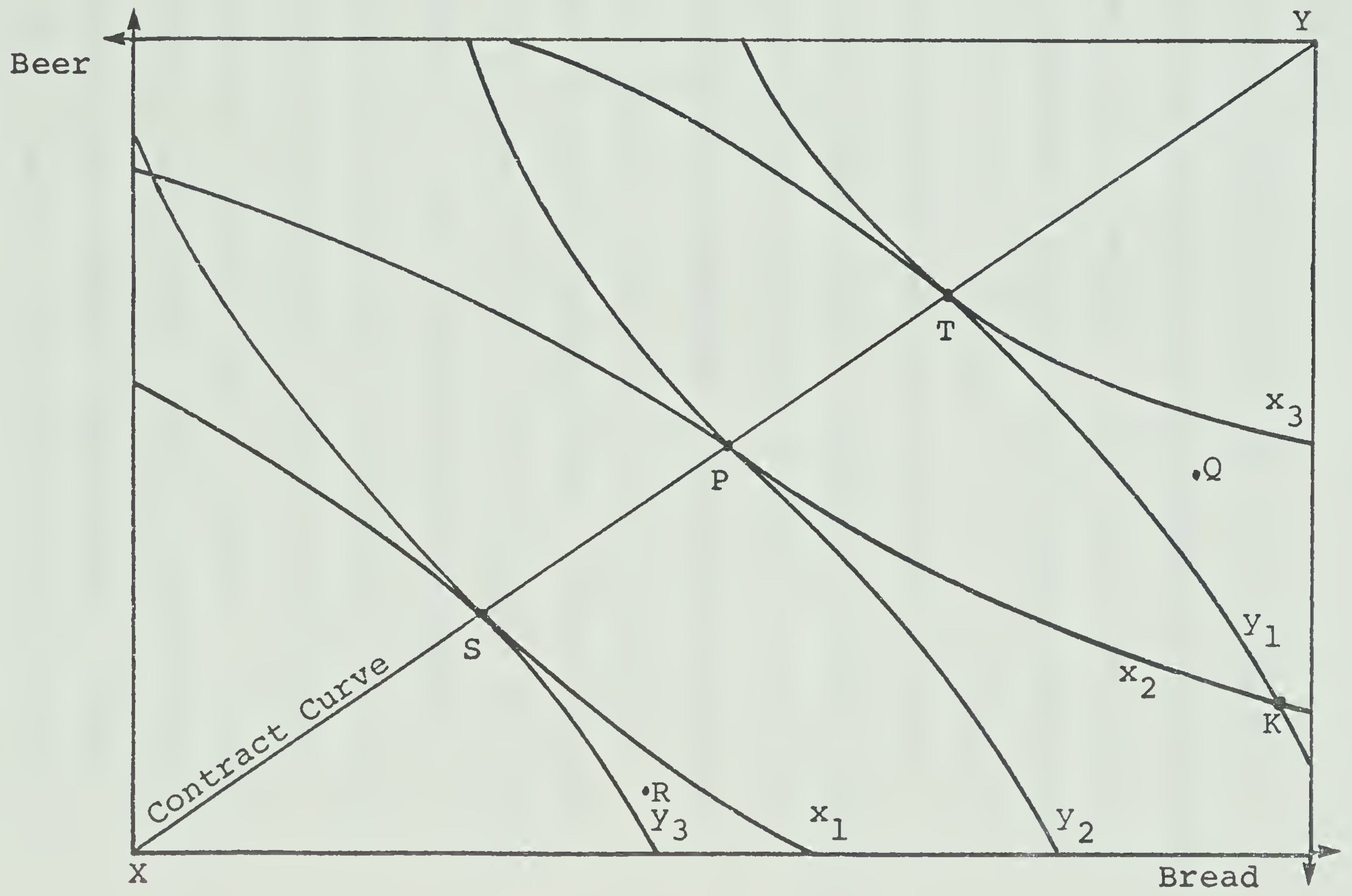
mum is observed with reference to Pareto's box diagram illustrating exchange between two individuals, and adding to it Edgeworth's contract-curve.

The construction is as follows. The indifference maps of two individuals are superimposed one upon the other, the map of the first individual drawn in the usual manner and the map of the second inverted, and drawn with the origin diagonal to the origin of the first map. The horizontal axis is taken to represent the first good in the exchange, its length representing the total stock of the good available to be shared by the two individuals. Similarily, the vertical axis is taken to measure the second good in the exchange, its length representing the total stock of the good available to be shared by the two parties. Calling the two individuals X and Y, and the two goods bread and beer, and plotting the locus of all tangency points, the diagram is as in Figure 2.1.

Beginning with any point not on the contract curve--the locus of all points of tangency, it is possible to move in some direction such that at least one individual benefits from the move while the other incurs no loss. For example, if point K is taken to be the original distribution of bread and beer between individuals X and Y, any move in a north-westerly direction within or on the indifference curves x_2 and y_1 which bound the area KPT, constitutes an improvement for at least one of the parties with no loss to the other. It is thus possible to imagine with one exchange or a series of

FIGURE 2.1

PARETO EXCHANGE EQUILIBRIUM



exchanges, a movement from the initial distribution K, to some point on the contract-curve between P and T inclusive. However, once a position on the contract-curve is attained--a Pareto optimum, any further exchange will be detrimental to at least one of the traders.

Intuitively, the Pareto definition of an economic optimum proves highly attractive as a benchmark and guideline for rational economic policy making. After all, what can be more rational than pursuing a policy which brings benefits to some and harm to none? Closer examination of the principle and realization of the assumptions and limitations of the analysis, however, cast doubt on the relevance of the criterion, and accordingly the former policy implications are limited. In the first place, the theory assumes that there are no external effects in consumption i.e., that an individual's utility depends only on his own consumption. To the extent that this assumption proves invalid, and individual satisfaction depends on others' as well as personal consumption, it is no longer possible to assume that an increase in the consumption of goods to one person only, others' consumption constant, will necessarily improve social welfare. In the second place, the theory assumes that actual market behavior is always indicative of real welfare improvements. Under some market situations, however, this may not be the case, as for example under conditions of imperfect knowledge among consumers and producers, decreasing costs, monopoly, public

goods and external effects in production.

Third, and fundamental to the question of the relevance of the Pareto criterion with respect to overall social welfare policy making, is that the concept of a particular Pareto optimum does not necessarily equate with the concept of a general optimum. Since the contract-curve describes the locus of an entire series of Pareto optima, each particular optimum relevant only to a particular region of possible initial income distributions, and since the Pareto criterion can not pronounce upon the relative social welfare positions of any two points on the contract-curve, in that they represent distributional shifts between the parties concerned, nothing concrete can be stated with respect to whether in the real world the Pareto optimum associated with the given income distribution should be pursued or whether some other position associated with a different income distribution should be. For example, referring again to Figure 2.1, to pursue the Pareto optimum T given an initial income distribution, say Q, is to implicitly assume that T is the best possible social welfare position. It may in fact be that some other point, say R, is from a social welfare standpoint preferred to T even though R is not even a Pareto optimum. In the event that the Pareto optimum which is relevant to the income distribution R, say S, is in the practical sense not available, it could still be preferable to pursue the non-Pareto optimum R, as opposed to T. Thus, the local optimum

nature of the Pareto principle severely limits the use to which it should be made in terms of social policy making, unless distribution is explicitly considered.

It is clear from Pareto's discussion of economic equilibrium within the context of a collectivist society that he was aware of the fundamental distinction between the so-called Pareto optimum and what has been referred to as general optimum. The general solution for"a collectivist society whose purpose it is to procure maximum ophelimity for its members," Pareto believed to be in the separation of the optimization problem into two distinct parts, production and distribution, and the solution of each independently according to different criteria. On the one hand, "it is necessary to bring in different kinds of ethical and social considerations" to the question of distribution, rather than allow distribution to take place "in accordance with all the historical and economic contingencies in which the society has evolved." On the other hand, once distribution is made on the basis of "certain ethico-social principles," production should proceed along Pareto optimal lines. Pareto continued,

> In order to obtain maximum ophelimity, the collectivist state will have to equalize the different net interests and determine the coefficients of production in the same way that free competition determines them. Moreover, after having made the distribution according to the rules from the first problem, it will have to permit a new distribution which the members of the collectivity can effect among themselves, or which the socialist state can make, but which, in any case, will have to be made as if it were effected by free competition.[1]

---

[1]Pareto, <u>Manual of Political Economy</u>, pp.267-268.

The crux of the issue is whether or not the problem of distribution can be legitimately separated from the question of production and the question of exchange, within the context of social welfare optimization. With regard, first of all, to distribution and production, it appears that the separation remains legitimate insofar as the notion of Pareto optimality is applied to "the choice of how best to produce a given output-pattern."[1] However, with regard to distribution and exchange, the legitimacy of separation becomes questionable. Since the application of Pareto principles for any given distribution of money income will generally have some impact on relative prices and outputs and hence the real distribution of income, there can be no guarantee that movement from a position of non-Pareto optimum to Pareto optimum improves social welfare in the wide sense. In other words, negative redistribution effects associated with the movement to a Pareto optimal position may overshadow any improvements in social welfare. Thus, there is no _a priori_ reason to believe that a movement in Figure 2.1 from income distribution R to a Pareto optimum on the contract-curve, S, constitutes an improvment in overall social welfare. As Dobb points out,

> The classic example of where the application or non application of the Pareto condition can certainly not be separated from distribution-effects--indeed is dominated by the latter--is that of rationing in war-time (or other situations of acute scarcity). This manifestly offends against the Pareto-condition because it is a limitation on free trading (in the sense of free consumers choice). Yet the alternative would be to allow the price of scarce necessities to soar, and to reach equilibrium between demand and supply through

---

[1] Dobb, _Welfare Economics and the Economics of Socialism_, p.23.

> so-called rationing by the purse. The result would obviously be a drastic worsening of the welfare-situation of the poor compared to the rich, perhaps with widespread starvation. In the case of any particular price-change this distribution-effect may be too small to be worth noticing or it may be large. Economists have no right to assume that it will always be negligibly small.[1]

The conclusion thus appears to be that the application of the Pareto principle is justified only when there are either negligible negative, or positive distribution effects from the movement toward a Pareto optimum. Even so, there is no guarantee that attainment of a Pareto optimum will be optimal in a truly general sense. A question to be raised is whether a unique general optimum--if such a unique position exists--will necessarily fall on the contract-curve. The answer to this question does not yet appear to have been solved. In any event, the notion of Pareto optimality, especially when distribution is not explicitly considered, cannot properly qualify as an unreserved benchmark and guide to general social welfare optimization.

With regard to the application of the Pareto principle in policy making, the concept proves to be of severely limited value. The difficulty arises when attempts are made to develop policies which provide benefit to some and harm to none within the context of highly complex, multi-sector economies. It was partly in recognition of this pitfall that the so-called Kaldor-Hicks compensation principle was developed.

---

[1]Ibid., p.24.

Pigou

The first major attempt to distinguish between social and private welfare valuations within the context of optimization, should be credited to A.C. Pigou.[1] Since Pigou was more concerned with the development of practical welfare principles than the creation of formal theory, his discussion is problem-oriented tending to provide policy direction rather than economic precision. Like his predecessors, his analysis is based upon the separation of distribution from exchange and production. His two basic propositions are:

> "Any cause which, without the exercise of compulsion or pressure upon people to make them work more than their wishes and interests dictate, increases productive efficiency, and therewith, the average volume of the national dividend, provided that it neither injures the distribution, nor augments the variability of the country's consumable income, will, in general, increase economic welfare."[2]

> "Any cause which increases the proportion of the national dividend received by poor persons, provided that it does not lead to a contraction of the dividend and does not injuriously affect the variability, will, in general, increase economic welfare."[3]

Pigou also outlined a corollary to his two welfare propositions to the effect that resources should be allocated in such a way that the social net product of the last unit of resource in any activity is equal. This corollary is crucial to the problem of optimization. However, with the principle in such general form, little can be learned with regard to

---

[1] A.C. Pigou, The Economics of Welfare (London: Macmillan and Co., 1920).

[2] Pigou, The Economics of Welfare, p.47, cited by Dobb, Welfare Economics and the Economics of Socialism, p.28.

[3] Pigou, The Economics of Welfare, p.53, cited by Dobb, Welfare Economics and the Economics of Socialism, p.28.

precisely how an optimum is attained. As a result, the corollary has since been restated and particularized into a set of optimum conditions. Following the approach of Dobb, the principle can be re-expressed in the form of a consumers' condition and two production conditions.[1] The fulfillment of all three implies optimization in the Pigouvian sense.

With respect to the consumers' condition, optimization requires, in the case of two goods, tangency between the budget constraint and a consumer's indifference curve, for each and every consumer. Alternatively the condition can be stated as requiring the equivalency of each consumer's marginal rates of substitution between goods, and the ratios of prices between goods; or indentically that the ratios of marginal utilities of goods are equal to the ratios of prices. This condition reguires simply that, given any set of prices as a parameter, each and every consumer allocates his income in order to maximize personal utility. That the condition is necessary but not sufficient for optimization of economic welfare is obvious when it is considered that the condition is capable of being fulfilled at any set of prices and any pattern of output. Thus, fulfillment of the condition is totally independent of the distribution of income.

With respect to the first production condition, optimization requires that the methods of production are such that no increase in production can be gained by changing factor proportions in any line of production i.e., that the

---

[1]Dobb, Welfare Economics and the Economics of Socialism, p.48.

ratios of factor substitution in all industries are equal at the margin. Thus, if in industry A capital can be substituted for labour at the margin in a ratio of 1:3, and in industry B the corresponding ratio is 1:4, it will be advantageous to transfer capital from A to B in return for labour from B, thereby increasing the total product of A without harming the product of B. Such transfers will prove beneficial until the point is reached at which the substitution ratios for A and B are identical. As Dobb has pointed out, in order that this condition make sense, it is necessary firstly, that factor resources be capable of measurement in terms of themselves and secondly, that different factors actually be capable of substitution. Nevertheless, the principle--which requires nothing more than that the most be made of the given resources --is "worth fulfilling in its own right."[1]

The second production condition requires that factor resources be optimally divided among alternative products in the sense that the value of the marginal product of resources be equal in all uses. Since valuation of the marginal product is in terms of final product prices, the set of prices functionally dependent upon specific demand patterns, the precise location of the optimum output pattern becomes relative to a specific income distribution. Thus, since the third condition is distributive relative, there is no *a priori* reason to

---

[1]Ibid., p.53.

assume that a position characterized by the fulfillment of all three conditions qualifies as an optimum in the general sense.

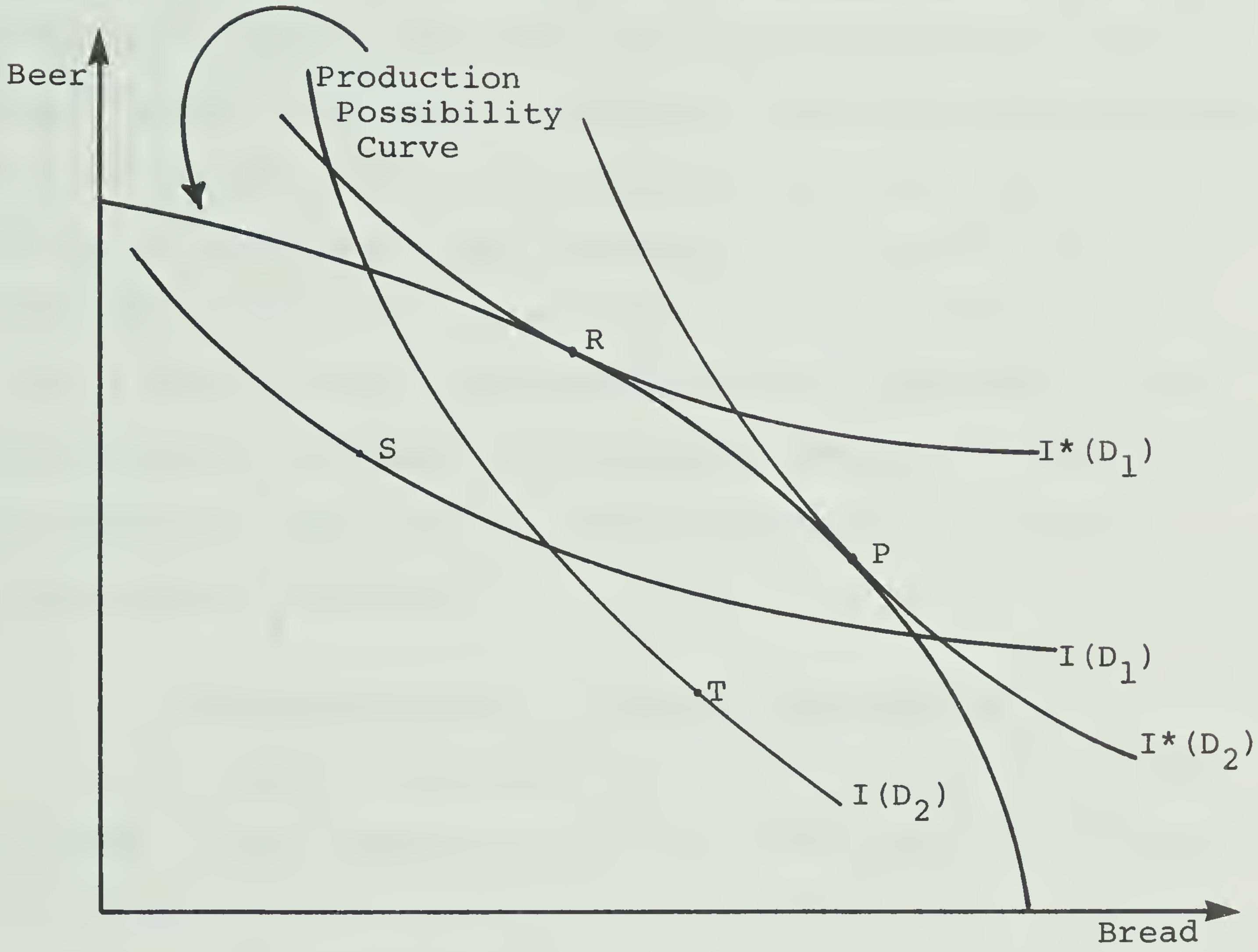
The argument can be clarified with reference to a production possibility curve diagram. Any point lying on the curve represents the fulfillment of the first production condition. If the axes are taken to represent bread and beer, any point of production inside of the curve can, by the application of the first production condition, be moved to fall on the curve. The precise location of the optimum, however, is defined by the fulfillment of the consumers' condition and the second production condition and is taken to be represented graphically as the point of tangency between the production possibility curve and a social indifference curve. Thus, in Figure 2.2, the optimum associated with a specific distribution of income, say D_1, is defined by the point R.

The question of the relevance of the optimum R, arises, however, when it is considered that social indifference curves relative to different income distributions are not required to possess the quality of non-intersection. It is possible then, that any point, say P, which lies on the production possibility curve, can be considered optimal given the appropriate initial distribution of income--in this case, say D_2. Nothing can be concluded regarding the preference relation between the optimum point R, associated with distribution D_1, and the optimum point P, associated with distribution D_2. Further, nothing can be stated regarding the preference rela-

FIGURE 2.2

THE EFFECT OF INCOME DISTRIBUTION

IN SOCIAL WELFARE ANALYSIS



tion between any two non-optimal situations, each relative to a different income distribution, say S associated with distribution D_1 and T associated with distribution D_2; nor between an optimal and a non-optimal situation each relative to a different income distribution, say R associated with the distribution D_1 and T associated with distribution D_2. Even if money income distribution is initially at some social optimum, however defined, there is no guarantee that the real distribution of income will remain optimal in the face of any subsequent relative price and output changes. Thus, since Pigou's corollary for optimization is not independent of the distribution of income, the optimum as defined is local only. The Pigouvian criteria can not be considered to define a unique general optimum.

Modern Approaches to General Optimization

The implicit dependency of Pigou's approach on interpersonal utility comparison, for its usefulness with respect to policy direction, led, by the 1930's--the era of revived scepticism to the cardinal approach--to a search for 'better' maximizing criteria. Since that time efforts have continued in basically two directions: the first--the 'new welfare economics' approach associated with the names of Kaldor, Hicks and Scitovsky--in a revamping of the Pareto concept into a 'compensation test'; and the second in an attempt to formulate an all inclusive social welfare function--generally associated with the names of Bergson and Samuelson.

The new welfare economics approach developed by Kaldor and Hicks is an attempt to explicitly separate the question of distribution from the question of efficiency in welfare analysis. Consequently, the social welfare movements associated with policy changes are estimated in terms of efficiency criteria only, while it is assumed that distribution problems are the responsibility of some outside force, presumably government authorities. By reference to efficiency considerations only, the economist's advice is thus placed within the sphere of positive economics.

Following this approach, the question of whether or not a given policy will yield social benefits is determined by a test of compensation. It is recognized that policies which yield benefits to some and harm to none are the exception rather than the rule and accordingly, the Pareto principle can offer little by way of practical policy advice. Instead, accepting that most policies benefit some and harm others, policies are evaluated in terms of their potential net efficiency benefits. Thus, policies which yield benefits sufficient to allow the gainers to more than compensate the losers are judged to increase social welfare. Insofar as the valuation of social benefits and costs are concerned the assumption often made in practice is that the marginal utility of income is equal among individuals and constant over the range of policy impacts. As a result, the valuation and distribution of benefits and costs are made independent. Further, since distribution is considered an entirely separate issue,

actual compensation of losers by gainers is not required. Any policy which yields potential positive net efficiency benefits is considered to be a move in the right direction.

The fallacy of the Kaldor-Hicks compensation argument is in the implicit and perverse assumption that the evaluation of net efficiency benefits, and hence potential change in social welfare, can be treated independent of the distribution of income. This criticism applies even when the equal constant marginal utility of income among individuals assumption is dropped and a system of weights is established by which to account for the distribution of benefits and costs in the valuation process. The fact remains that whether a particular policy is judged acceptable or not from the point of view of the compensation principle depends also on the set of prices and pattern of output used in the process of evaluation and hence the distribution of income This was pointed out by Scitovsky and subsequently refined by Little.[1] For example relative to the present distribution of income a policy designed to shift the pattern of output may be judged as socially beneficial from the point of view of the compensation criteria. However, relative to the distribution of income associated with the new output pattern--which may be different than the original distribution as a result of policy induced distribution shifts--the original output pattern may be judged superior to the new. The principle of hypothetical compensation in such a situation, would then indicate that a movement back to the original output pattern is socially beneficial. The question

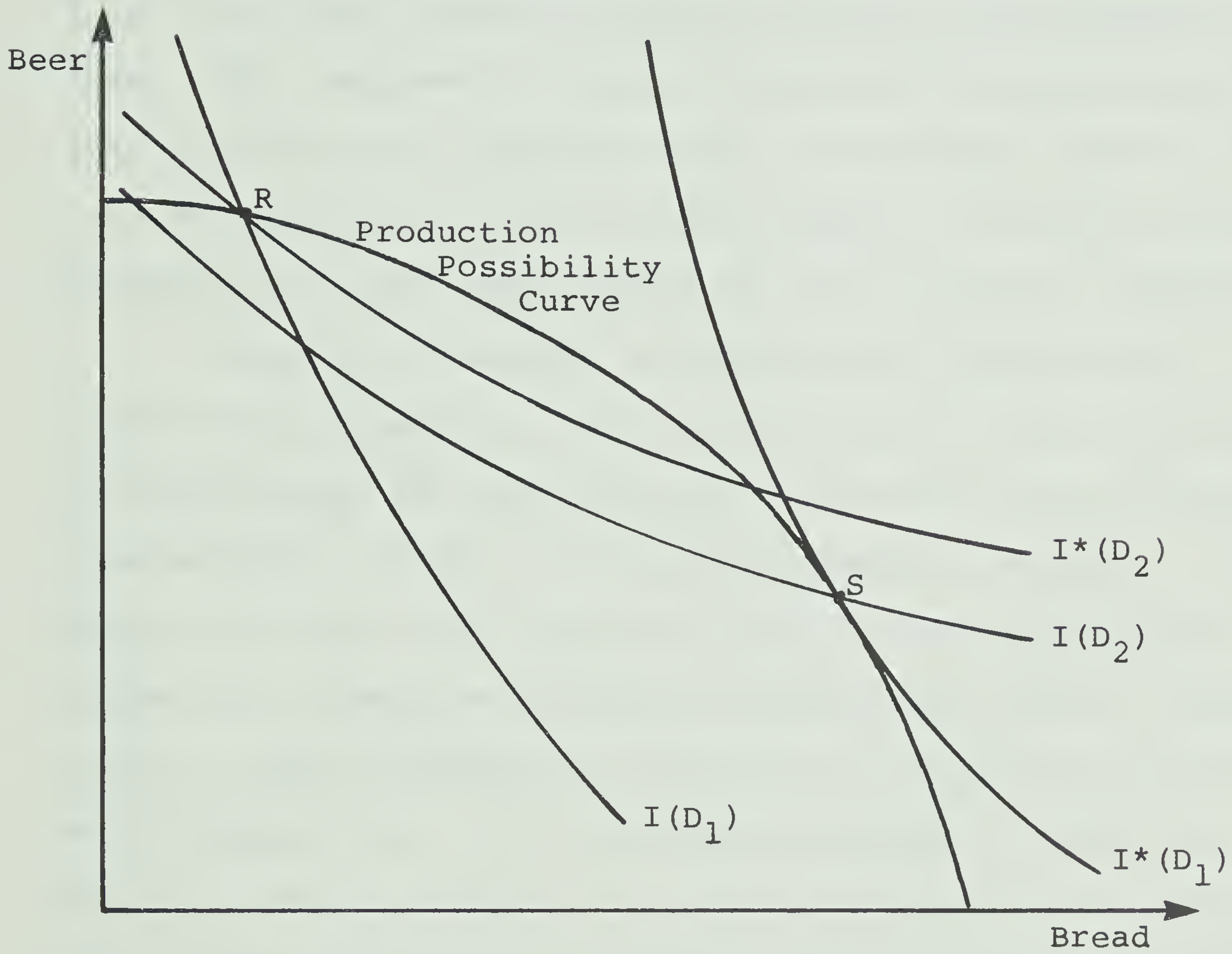
[1] I.M.D. Little, A Critique of Welfare Economics, 2nd ed. (Oxford: Oxford University Press, 1957).

thus remains as to which distribution of income should be regarded as relevant. Even if relative to either distribution, the new output pattern is judged superior, there is no guarantee that there is no other distribution which would put the new pattern of output in the shadow of the old. The evaluation thus remains distributive relative and as such it is misleading to argue that policy decisions can properly be made on the basis of efficiency criteria only. As Little argues, only when it is sure that the distribution of income is not harmed by a movement to a new position can policy decisions be made with respect to efficiency criteria only.

The argument can be clarified with reference to Figure 2.3. Calling the commodities bread and beer, a production possibility curve is constructed. Social indifference curves relevant to various income distributions are also depicted. Suppose that production of bread and beer is initially at R, and the social indifference curve passing through R and relevant to the initial distribution of income, say D_1 is I (D_1). If a policy designed to move from R to a socially optimal position with respect to the distribution D_1, say S, is now implemented, then from the point of view of hypothetical compensation, there is a potential improvement in social welfare i.e., a movement denoted by a shift to the higher indifference curve associated with distribution D_1, say $I^*(D_1)$. The move, however, constitutes an hypothetical improvement relative to D_1 alone, and it is by no means certain that relative to some other distribution S will be judged as superior. Thus, in Figure 2.3, relative to the distribution of

FIGURE 2.3

DISTRIBUTION AS A RELEVANT
CONSIDERATION IN THE THEORY
OF SOCIAL WELFARE MAXIMIZATION



income D_2, the move from R to S is judged as potentially detrimental to social welfare in that it constitutes a shift from the social indifference curve $I^*(D_2)$ to the lower social indifference curve $I(D_2)$. In fact, given the original distribution of income D_1 the move from R to S may be accompanied by non-compensated distributional shifts such that the distribution of income when S is reached actually becomes D_2. Thus, whether R or S is judged superior depends upon the distribution of income. The compensation test is distributive-relative, and unless distributional judgements are incorporated explicitly into the analysis, it has little to offer in the way of policy prescription within the context of social welfare improvements.

Since the principle of hypothetical compensation is distribution relative, it would seem doubtful that questions of distribution can legitimately be divorced from efficiency considerations within the context of welfare analysis. Only when it is known with certainty that the real distribution of income will always be optimally adjusted upon policy implementation, could recommendation proceed on the basis of efficiency criteria only. Yet the theory provides no gauge by which to actually measure the welfare consequences of changing distribution and hence provides no basis on which to define the socially optimal distribution of income. The presumption is always in favour of the existing distribution. The economist, however, has no right, as a scientist concerned with the optimization of social welfare, to make any such presumption, especially within the context of the free economy, where a

frequent tendency is for the state to practice a policy of non-interference. Instead, distribution should be considered as part and parcel of any realisitc welfare proposition. As Scitovsky has concluded, "in the free enterprise economy all economic policies must be appraised by their effects on efficiency and equity simultaneously; and no recommendations can be made on the basis of one of these criteria alone."[1] Unless distribution is explicitly considered, as suggested by Little, use of the 'new welfare economics' is restricted in its application to policy formation.

The approach which has been hailed by some as the most promising new concept in welfare economics is the social welfare function. Initially proposed by Bergson in 1938[2] and further developed by Samuelson and Tintner, the social welfare function can basically be considered as a function of individual's welfare, which is in turn dependent upon both personal welfare and the individual's concept of the distribution of welfare in the community. By maximizing the function subject to the production function, it would appear that questions of both exchange and production, and distribution, are solved internally. As a result, the conditions required to fulfill maximization automatically become the goals of economic policy.

---

[1]Tibor Scitovsky, Papers on Welfare and Growth (London: George Allen and Unwin Ltd., 1964), pp.182-183.

[2]A. Bergson, "A Reformation of Certain Aspects of Welfare Economics," Quarterly Journal of Economics 52 (February 1938): 310-334.

Unfortunately, the social welfare function approach is not without its problems. Three fundamental criticisms emerge.[1] In the first place, and most important from a practical standpoint, the function as specified must be so completely general that it is difficult to imagine of what practical use the function could ever be made. As Dobb has said, "The Social Welfare Function (if one has understood it correctly) is an elegant example of the kind of formalism, so much in vogue today, which greatly facilitates analysis by supposing crucial problems to be solved by some ingenious (but undisclosed) device without providing any actual means for their solution."[2] Secondly, the social welfare function does not eliminate the necessity of making value judgements. In the same way that classical economists were required to make judgements regarding interpersonal utilities, the economist using a social welfare function approach is required to attach weights to the preferences of different individuals within the community. In the absence of a known "proper" weighting system, the economist must devise one according to his own judgement. Thus, the social welfare function can not qualify as a purely positive approach to welfare optimization. Finally, Arrow[3] has pointed out that only under special circumstances will the construction of a general social welfare

---

[1]The criticisms are pointed out by Scitovsky, Papers on Welfare and Growth, pp.183-188.

[2]Dobb, Welfare Economics and the Economics of Socialism, p.112.

[3]Kenneth Arrow, "A Difficulty in the Concept of Social Welfare," Journal of Political Economics 58 (August 1950): 328-346.

function yield non-contradictory social orderings of policy alternatives, thereby limiting severely its applicability.

Income Distribution and Welfare Theory: Summary

The fundamental difficulty in welfare economics, the formulation of a valid set of welfare maximizing conditions, stems from the fallacious assumption that questions of exchange and production can legitimately be divorced from the question of income distribution. Accordingly, the development of thought in welfare theory has been to define an optimum position in terms of efficiency criteria only, and to almost completely ignore distribution. The result of this theoretical approach has been for economists to place inordinate amounts of emphasis on the economics of production within the context of economic policy development, and to place little or no emphasis on the distributional impacts of economic policy on social welfare. Yet distribution does matter and hence should be considered in policy formulation.

Of course, to argue in the first place, that a study of welfare economics--which is, after all, a study of economic welfare--can lead to an understanding of social welfare, is like Pigou, to assume that total social welfare movements can be guaged by movements of economic variables. Such an assumption might be queried within the context of market failure. Nevertheless, on the premise that a study of economic welfare can lead to an understanding of total social welfare, it is important that all factors influencing economic

welfare be clearly specified. Inclusion of income distribution as a factor and, hence, its due consideration in policy development, would certainly be a step in the right direction.

CHAPTER III

THE MEASUREMENT OF INCOME DISTRIBUTION

The Optimal Distribution of Income

Once it is established that the distribution of income is of fundamental importance to social welfare maximization it follows that comparisons of income distributions should be made according to the impact of each distribution on social welfare. As Dalton argued in 1920, "the economist is primarily interested, not in the distribution of income as such, but the effects of income upon the distribution and total amount of economic welfare, which may be derived from income."[1] Thus, any technique by which to measure and compare income distributions should find its substance in the underlying notion of a functional relationship between the distribution of income and social welfare. In the absence of any clearly defined social welfare function, however, the precise nature of the relationship remains unknown and the 'ideal'distribution of income depends upon the assumptions made with respect to the specification of the social welfare function.

---

[1]Hugh Dalton, "The Measurement of the Inequality of Incomes, Economic Journal 60 (September 1920): 348.

A common treatment has been to assume that the social welfare function is an additively separable and symmetric function of individual utilities--and hence individual incomes, increasing and concave, with the resulting implication that an equal distribution of income is optimal. This was the route initiated by Dalton. Accordingly, he proposed that a measure of the distribution of income be defined as the ratio of the total economic welfare attainable under equality of incomes to the total economic welfare under a given distribution. When this ratio is equal to one the distribution is equal; when it exceeds one the distribution is unequal. Thus, this measure of the distribution of income is made, in essence, in terms of deviations from equality, which is the optimal distribution. Under a different specification of the social welfare function, the optimum distribution may legitimately deviate from equality or may not even be defined precisely. In any event, the measure would ideally be made with respect to some concept of an optimal income distribution. The problem is that in order to actually quantify the distribution of income in terms of a social welfare ratio, it is necessary to first make a number of important and arbitrary assumptions regarding the nature of the social welfare function and, since the assumptions are normative, the validity of the measure of income distribution is open to question. The point can be illustrated with reference to Figures 3.1 to 3.4. The total income to be distributed between two individuals, say A and B, is denoted by the horizontal distance ab. A movement from

FIGURE 3.1

IDENTICAL CONCAVE INDIVIDUAL UTILITY FUNCTIONS

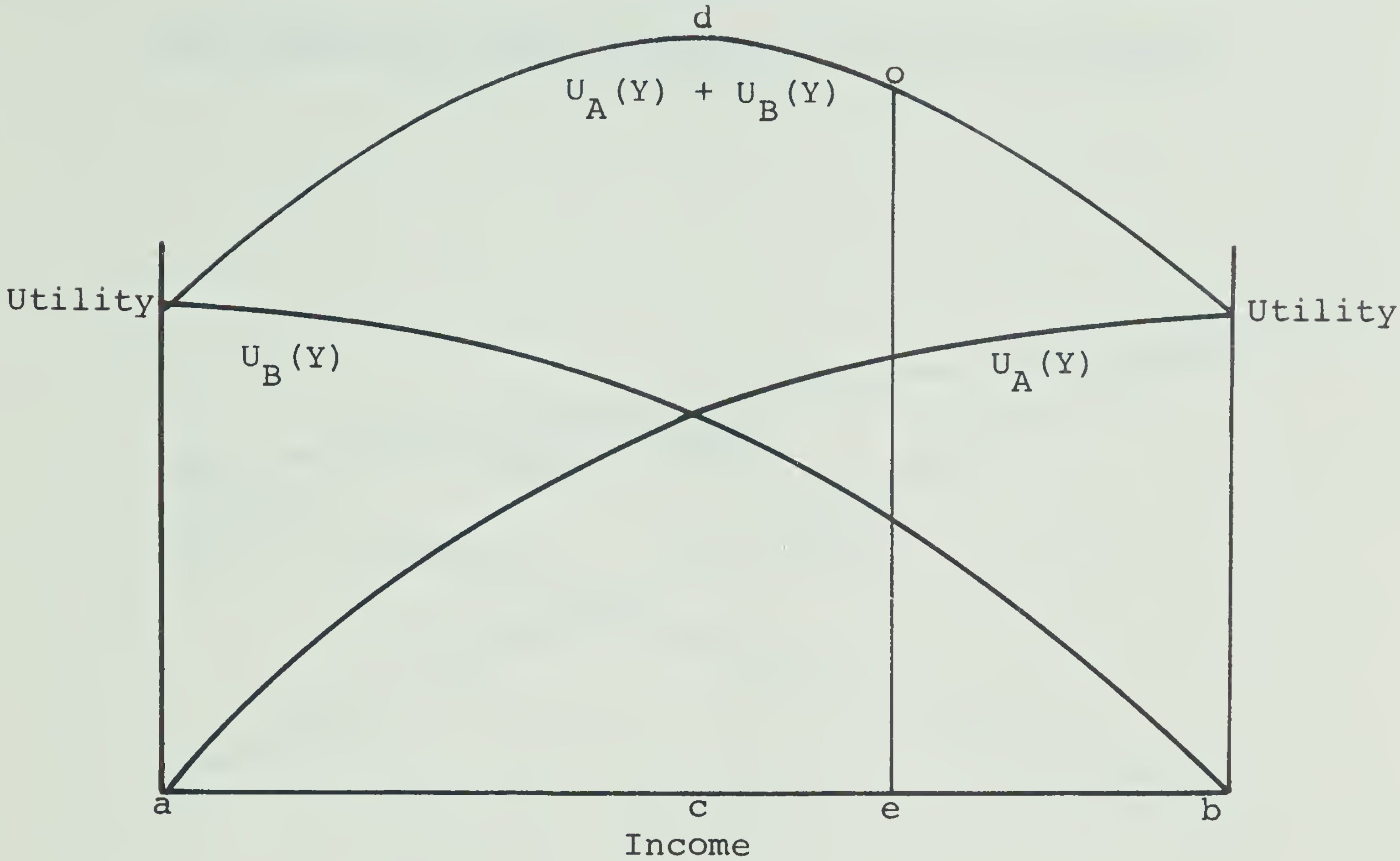


FIGURE 3.2

IDENTICAL LINEAR INDIVIDUAL UTILITY FUNCTIONS

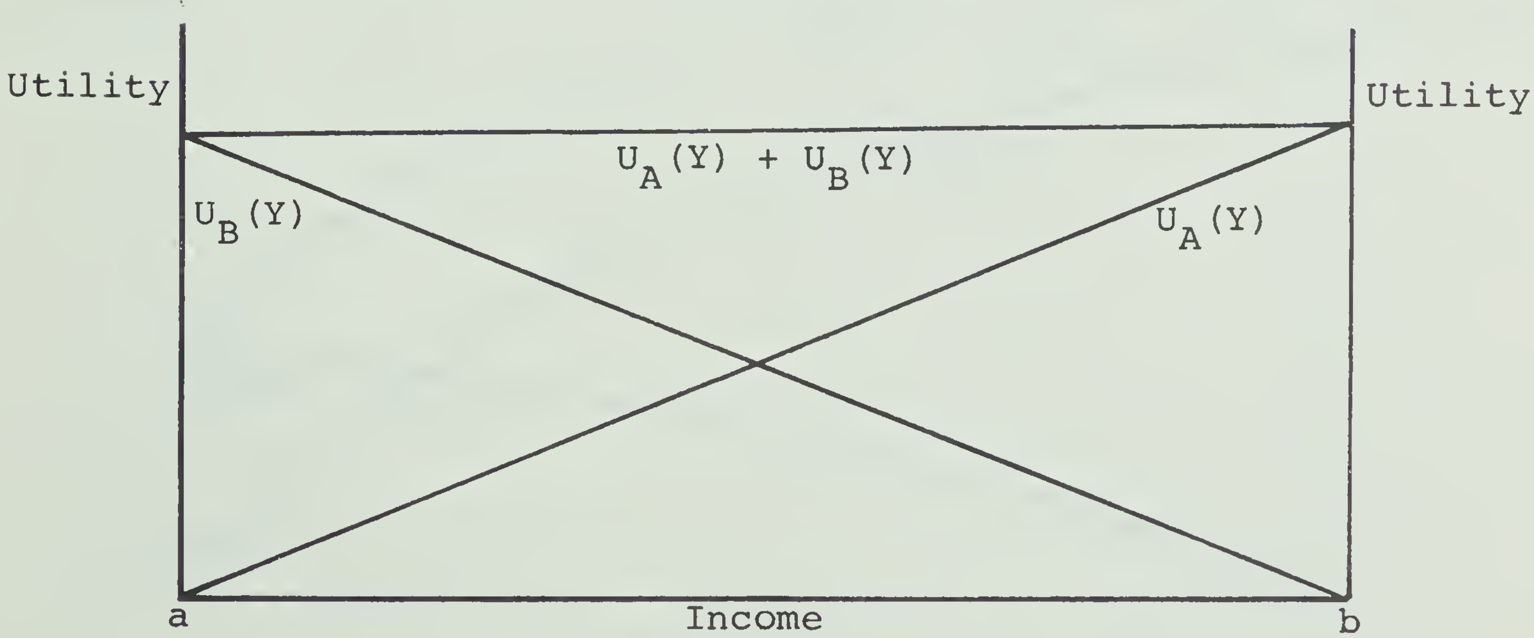


FIGURE 3.3

NON-IDENTICAL LINEAR INDIVIDUAL UTILITY FUNCTIONS

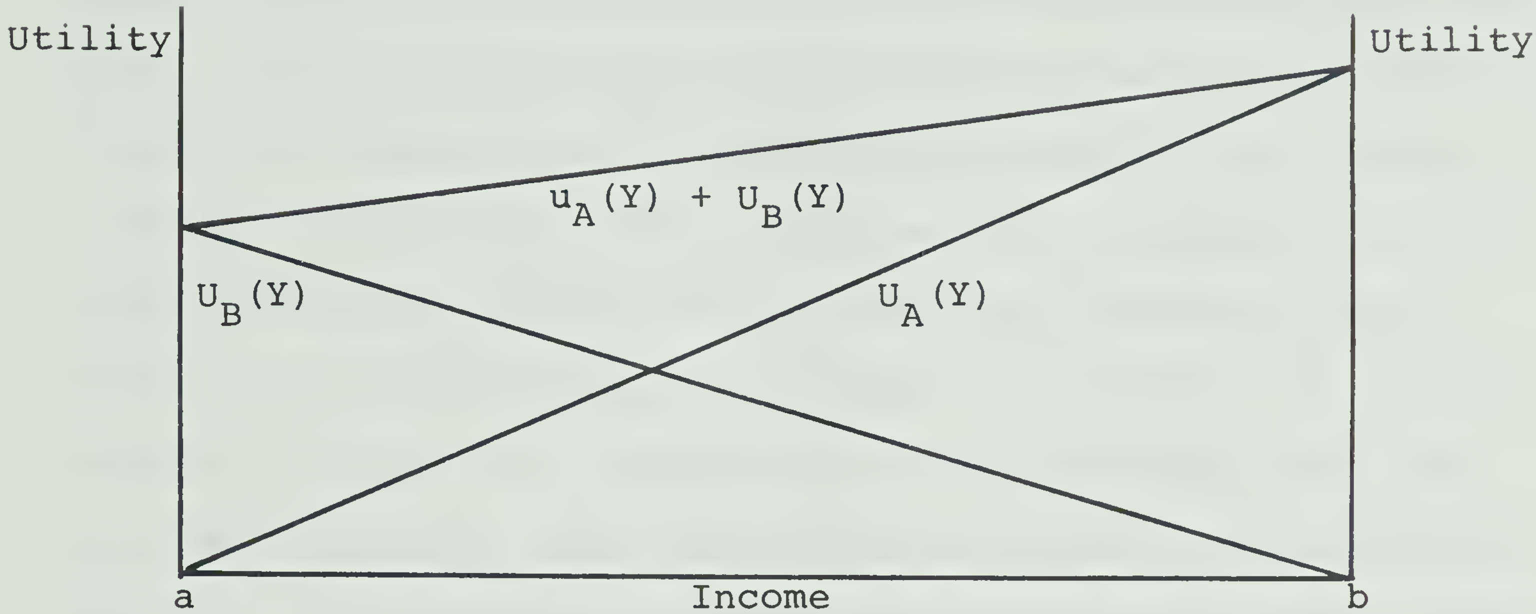
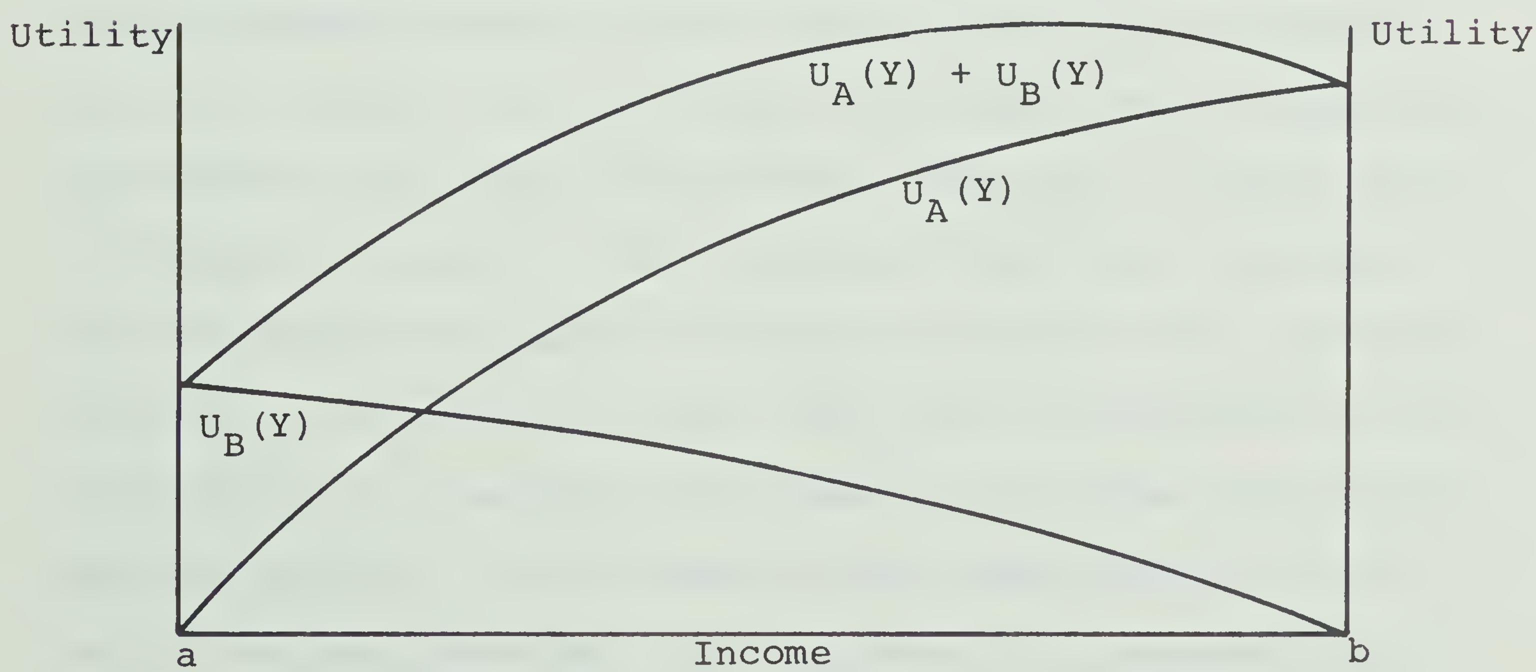


FIGURE 3.4

NON-IDENTICAL CONCAVE INDIVIDUAL UTILITY FUNCTIONS



point a toward point b implies redistribution of ab in favour of A and at the expense of B. Thus, at a, all income accrues to B; at b, all income accrues to A; and at some point between a and b, say c, ac accrues to A, and cb accrues to B. Utility curves for each of individuals A and B, respectively $U_A(y)$ and $U_B(y)$, can be constructed, and assuming that social utility is an additive function of the individual utilities of A and B, a social utility curve can be constructed by summing the vertical distances (utility) of the individual curves at every point (every distribution) on the horizontal axis. If, for example, in Figure 3.1 the utility curves of A and B are concave and identical, then the optimum distribution of income is equality. The measure of income distribution will then be the ratio of the optimum level of social utility to the level of social utility associated with the given distribution; for distribution c this is oe/dc. If, however, the individual utility curves are identical but linear, as in Figure 3.2, no single optimum exists; rather, any distribution is optimal. If, as in Figure 3.3, the curves are linear but not identical, the optimum will imply distribution entirely in favour of one individual. Finally, concave but non-identical individual utility curves may imply a non-equal optimal income distribution, as in Figure 3.4. Thus, the point of reference for the calculation of a welfare ratio measure of income distribution such as Dalton's, is dependent on the specification of the social welfare function. Further, even if a concensus was obtained with respect to the general form of the function--

and hence distributions could be ranked--it is unlikely that actual quantification would lead to universal agreement on the exact valuation of distributions, since this would require concensus on the precise specification of the function. In order to escape this problem, Atkinson[1] proposes the adoption of a new measure of income distribution which is invariant with respect to linear transformations. Accordingly, he introduces the concept of an equally (optimally) distributed equivalent level of income--the level of income which if equally (optimally) distributed would yield the same level of social welfare as the present level and distribution of income--and defines the measure of distribution as one minus the ratio of the equally (optimally) distributed income level to the present income level. The problem with such a measure is once again the inherent dependency on the specification of the social welfare function.

Since the precise specification of the social welfare function remains unknown, the distribution of income can not be quantified in welfare ratios. Rather, distribution must be measured in terms of the deviations from some pre-determined distributional norm. This norm has generally and conveniently been considered as perfect equality of individual incomes. The choice of equality as the distributional point of reference reflects the normative tendency to prefer that individuals be treated equally. Thus, the measure of income

---

[1]Anthony B. Atkinson, "On the Measurement of Income Inequality", Journal of Economic Theory 2 (September 1970): 244-263.

distribution typically becomes a measure of inequality. That the choice of a given summary measure of inequality implicitly involves a normative judgement with respect to the specification of the social welfare function has, at least until recently, not been recognized. Since no measure of inequality exists independent of implicit assumptions about the social welfare function, it would seem wise to make such assumptions explicit so that choice of a specific measure of inequality can be made consistent with whatever social welfare function is considered valid. In other words, implicit value judgements which inescapably accompany any measure of inequality, should be made explicit with the measure--and hence the rankings of distributions derived thereof, standing or falling on the basis of the normatively judged validity of the underlying social welfare function.

Perhaps the most widely used technique by which income inequality has been ranked is the Lorenz curve and its related summary statistic, the Gini coefficient. Briefly, construction of a Lorenz curve consists of graphing the cumulative percentages of total income received by individuals (groups), from the poorest to the richest. Thus, for example, the poorest zero percent of the population will receive zero percent of the total income; and, so on until the poorest one hundred percent receives one hundred percent of total income. The line of perfect equality is a straight line joining (0,0) and (100, 100), while deviations from perfect equality are reflected by a convex curve joining the above two points.

Table 3.1 represents an hypothetical income distribution and Figure 3.5 is the Lorenz curve associated with that distribution. The familiar Gini coefficient is derived from the Lorenz curve by taking the ratio of the area between the curve and line of equality to the entire area under the line of equality, usually by linear approximation of the areas--in Figure 3.5, A/(A + B).

The advantage of Lorenz curve comparisons is that much can be stated about the comparative levels of social welfare without rigorous specification of the social welfare function. Drawing from the field of uncertainty theory and assuming the social welfare function to be strictly concave, additively separable and symmetric, Atkinson in 1970[1] was able to demonstrate that whenever the Lorenz curve associated with one distribution, say f(y) with mean μ, falls completely inside the Lorenz curve associated with another distribution, say f*(y) with mean μ^*, and providing $\mu \geq \mu^*$, the level of social welfare for f(y) exceeds the level of social welfare for f*(y). Thus, not only does a higher Lorenz curve throughout imply a more equal distribution of income in a purely descriptive sense but by Atkinson's theorem, this also implies that the distribution is better from a welfare point of view. This theorem attracted a good deal of discussion in welfare economics circles and was subsequently refined and extended to more general social welfare functions. A stronger

---

[1] Ibid.

TABLE 3.1

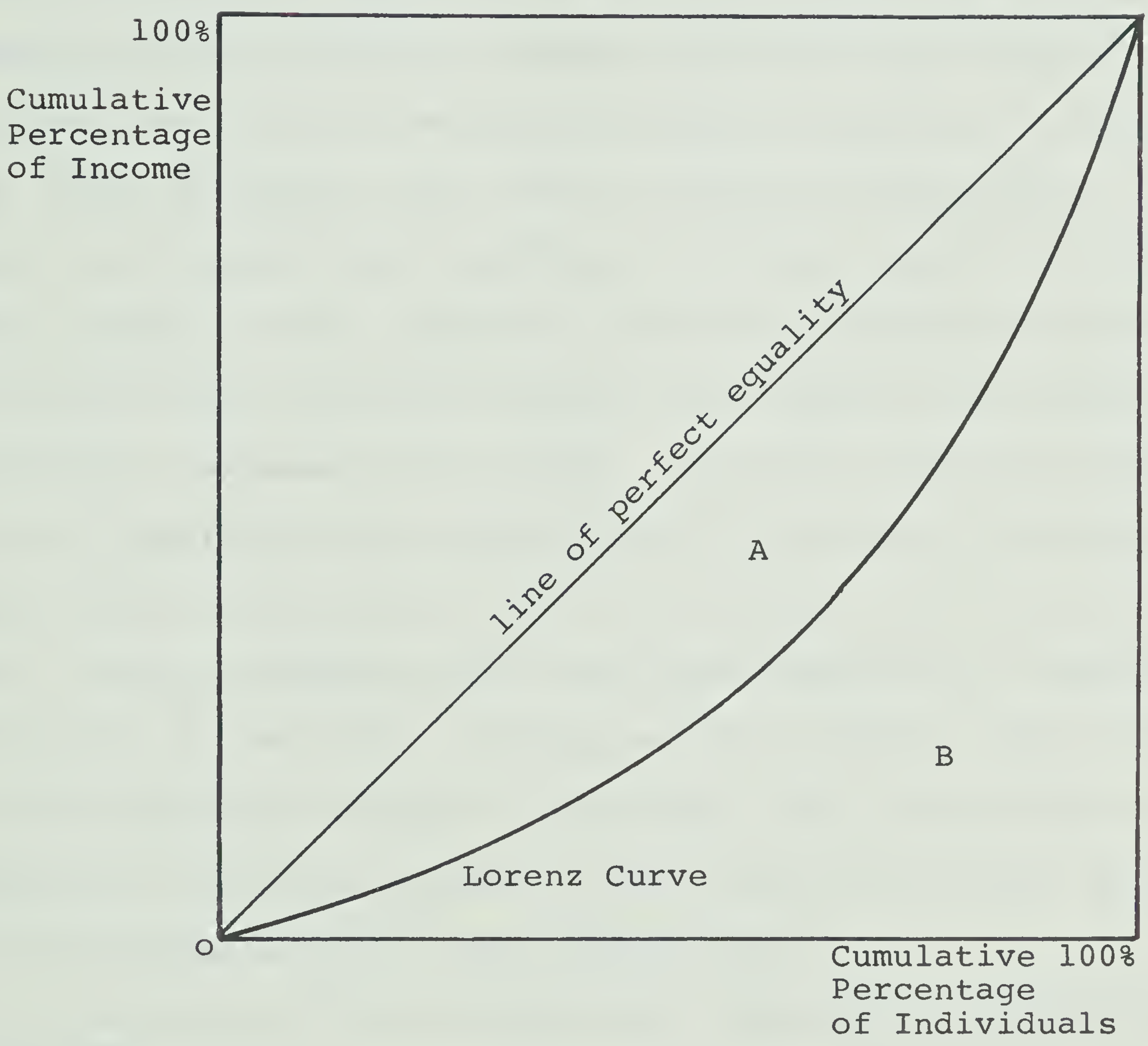
AN HYPOTHETICAL PERSONAL DISTRIBUTION OF INCOME

Cumulative Percentage of Individuals from the Poorest to the Richest	Cumulative Percentage of Total Income Accruing to Individuals from the Poorest to the Richest
0	0
20	5
40	15
60	30
80	55
100	100

FIGURE 3.5

A LORENZ CURVE CONSTRUCTED

FROM DATA IN TABLE 3.1



version developed by Dasgupta, Sen, and Starrett in 1973[1] showed that Atkinson's results do not depend on the assumptions of additive separability and increasing strict concavity. Similarily, Rothchild and Stiglitz[2] were able to demonstrate a less restrictive version of the theorem by extending their earlier work in uncertainty theory. Although based on highly technical concepts, the less restrictive versions basically demonstrate that any social welfare function which responds positively to a finite sequence of single transfers of income from richer to poorer--the kind of transfers which shift a Lorenz curve upward--will suffice to increase social welfare. Thus, without further specifying the social welfare function, it follows that a less flat Lorenz curve implies more social welfare for the same total income. It might further be noted that, at least under the assumption of an arbitrary concave social welfare function and for distributions with the same mean, the most commonly used statistical measures of inequality (including the variance, coefficient of variation, the relative mean deviation and the Gini coefficient) will yield identical rankings of the distributions if and only if the Lorenz curves of the distributions are non-intersecting.[3]

As A.K. Sen[4] has pointed out, the welfare significance

---

[1]Partha Dasgupta, Amartya Sen, and David Starret, "Notes on the Measurement of Inequality," Journal of Economic Theory 6 (April 1973): 180-187.

[2]Michael Rothchild and Joseph E. Stiglitz, "Some Further Results on the Measurement of Inequality," Journal of Economic Theory 6 (April 1973): 188-204.

[3]Atkinson, p.252.

[4]Amartya K. Sen, On Economic Inequality, The Radcliffe Lectures Delivered in the University of Warwick, 1972 (Oxford: Clarendon Press, 1973), p.58.

of the extended Lorenz curve theorem should be interpreted cautiously since it applies only to curves drawn on a person to person basis. For curves drawn from group data, it can never be certain that Lorenz curves do not cross, even if as constructed they appear not to do so, since group data inherently hide income distribution within groups. Also, problems exist when comparing the relative welfare positions of two distributions, say f(y) and f*(y), when the Lorenz curve of f(y) falls strictly within the Lorenz curve of f*(y), but the mean of f(y), say μ, is less than the mean of f*(y), say μ^*. In the descriptive sense, however, the Lorenz criterion is a useful measure. "Even without bringing in anything about welfare, a transfer from the rich to the poor must mean descriptively that the level of inequality has gone down, and thus a higher Lorenz curve must mean less inequality even in the purely descriptive sense."[1]

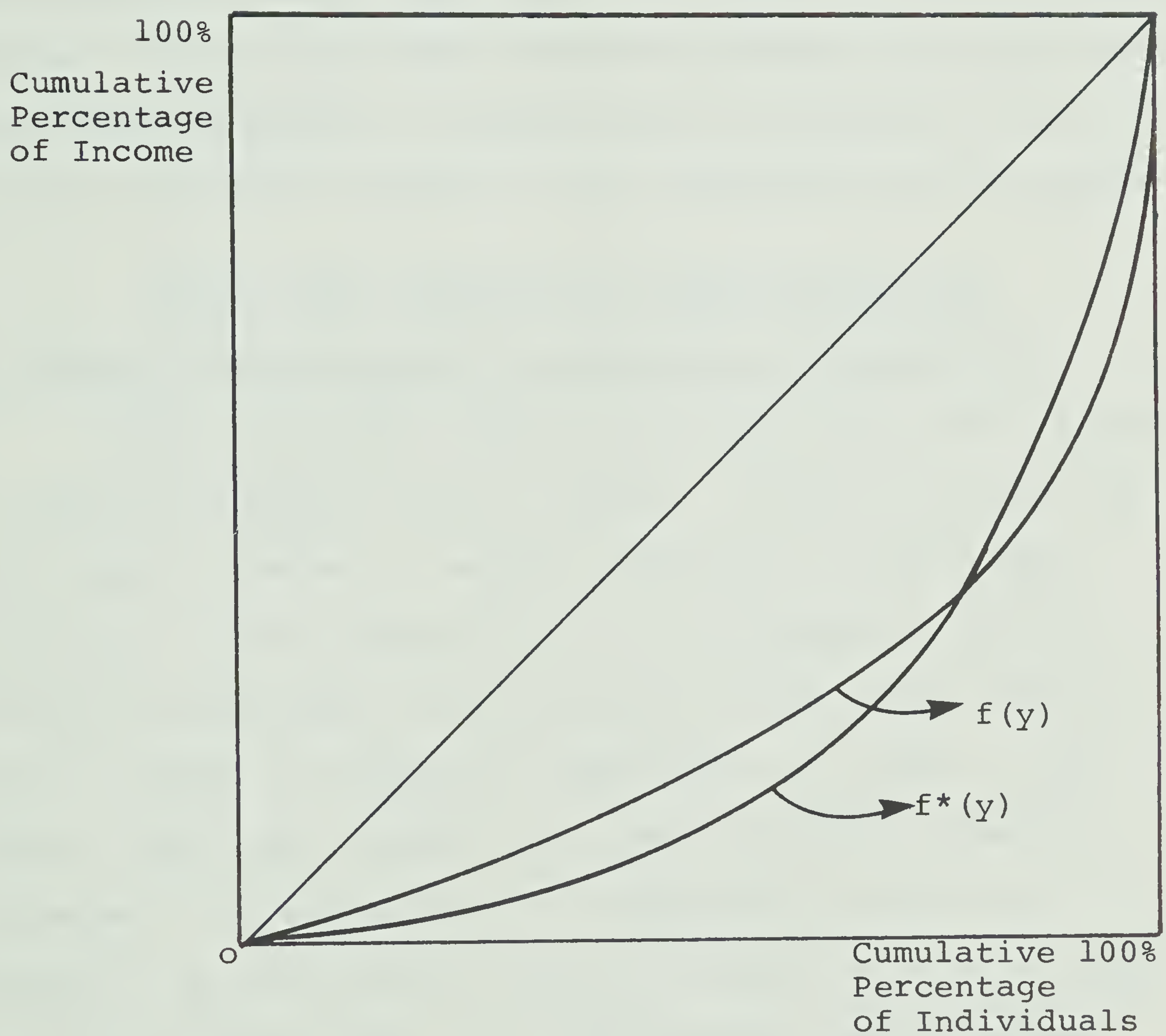
Problems arise with the use of Lorenz curve criteria, both in the welfare and descriptive senses, when the curves of various distributions intersect. If two Lorenz curves cross--the curves associated each with a different distribution, but the distributions, for the sake of simplicity, each with the same mean and population--nothing can be said about the relative welfare positions of the distributions; nor can the distributions be compared in a purely descriptive sense. For example, referring to Figure 3.6, the Lorenz curve associated with distributions f(y) and f*(y) indicate that on

---

[1] Ibid., p.62.

FIGURE 3.6

INTERSECTING LORENZ CURVES



the lower end of the income scale f(y) is more equal than f*(y), while on the upper end of the income scale the converse is true. Overall, nothing can be said regarding the relative welfare positions nor the relative levels of inequality. To make such evaluations, further specification of the welfare function would be required such that weights could be attached to transfer of income from richer to poorer at various income levels. In the event that the mean incomes of the distributions were not equal, it would also be necessary to attach welfare significant weights to the absolute size of incomes.

Some Common Measures of Income Inequality

Two Welfare Considerations for Measures of Inequality

Since, for most purposes and especially with respect to practical economic policy making, the use of Lorenz criteria poses a number of serious problems, it would seem desirable to turn instead to an all encompassing summary statistic reflecting the true nature of the social welfare function which is capable of describing, at least in the ordinal sense, the welfare positions of various economic situations. Alternatively, if inequality per se is of interest, the statistical device used must be able to properly rank distributions with intersecting Lorenz curves. This requires the statistic to weight income transfers at different income levels. Empirically, and almost exclusively, attempts have been made to measure income distribution in terms of inequality. As such, a number of different measures

have been used including the range, the relative mean deviation, the variance, the coefficient of variation, the standard deviation of logarithms, and the Gini coefficient. In fact, little justification has generally been given for the choice of one measure above another, except in terms of the ease of computation, ease of interpretation, and appropriateness of the data. In 1920 Dalton suggested that in most cases these measures would give the same rankings. However, the work of a number of researchers has not borne out this expectation and has shown instead that the measures frequently yield quite different rankings.[1] The justification for choosing a measure of inequality should not be in terms of practical considerations only--ease of computation, etc.--but also in terms of the welfare implications of one measure as opposed to another. With respect to welfare criteria, two considerations should be applied to the various measures and the measures judged accordingly. The first criteria was suggested by Dalton[2] in 1920 and subsequently revived by Atkinson[3] in 1970. According to the principle of transfers, a proper measure of inequality should be positively sensitive to the type of income transfer which takes place from richer to poorer persons but which does not reverse their relative income position. The second criterion is suggested by Atkinson and is concerned with the

---

[1]Atkinson cites examples of this with reference to K.R. Ranadive, "The Equality of Incomes in India", Bulletin of the Oxford Institute of Statistics 27 (May 1965), and D.B. Yntema, Measures of Inequality in the Personal Distribution of Income or Wealth", Journal of the American Statistical Association 28 (December 1933).

[2]Dalton, p.351.

[3]Atkinson, p.254.

influence of the overall level of income on the measure of inequality. Following Atkinson, if it is decided that the measurement of the degree of inequality should be considered independent of the mean level of income, that statistic used should exhibit what Atkinson refers to as constant inequality -aversion. Thus, if distribution f*(y) is simply a 'scaled up' version of distribution f(y) i.e., identical Lorenz curves but a higher mean level of income associated with f*(y), then constant inequality-aversion implies that the degree of inequality for each distribution is the same and that the statistic should reflect this. If, however it is decided that the degree of inequality should be considered dependent upon the mean level of income such that the statistic exhibits increasing (decreasing) inequality aversion, then if distribution f*(y) is simply a 'scaled up' version of distribution f(y), the statistic of inequality describing distribution f*(y) should be greater than (less than) the statistic for f (y).

In the following sections of this chapter these welfare criteria--Dalton's principle of transfers and Atkinson's principle of inequality-aversion--are used to evaluate the different possible measures of income inequality.

The Range

The range is defined as the gap between the highest and lowest income levels as a ratio of the mean income. Calling the mean, μ, the highest income level, H, and the

lowest, L, the range is defined as:[1]

$$R = \frac{H-L}{\mu}$$

If income distribution is equal, then R=0. If only one person receives all the income, the range will equal the total number of people, n. The problem with this statistic is that the range ignores the distribution between the extremes and as such is unresponsive to transfers of income from richer to poorer persons within the extremes. As a result, the range fails the first welfare criterion by not being positively sensitive to income transfers from richer to poorer persons. By concentrating on the extremes, the range does not provide a good measure of income inequality.

The Relative Mean Deviation

The relative mean deviation is defined as the ratio of the sum of absolute deviations of individual incomes from the mean, to total income. Thus, calling total income Y, the number of individuals n, individual incomes Y_i, i = 1...n, and the mean income μ = Y/n, the relative mean deviation is defined as:[2]

$$RMD = \sum_{i=1}^{n} \left| Y_i - \mu \right| / Y$$

Although the relative mean deviation avoids the problem of neglecting the interior of the distribution by comparing the income level of each individual with the mean income, it is insensitive to transfers of income on the same side of the

---

[1] Sen, On Economic Inequality, p.24.
[2] Ibid., p.25.

mean and thus fails to meet the criteria of responding positively to any transfer of income from richer to poorer person.[1]

<u>The Variance</u>

The variance is defined as the sum of squares of deviations of individual incomes from the mean, divided by the total number of income earning units. It is defined as:[2]

$$V = \frac{1}{n} \sum_{i=1}^{n} (Y_i - \mu)^2$$

Since the deviations are squared, more emphasis is placed on incomes which deviate substantially from the mean and, as a result, a transfer from a richer to a poorer person will lead to a decline in the variance, irrespective of the point in the distribution at which the transfer takes place. Thus, the variance responds positively to the first welfare criteria as proposed by Dalton in his principle of transfers. With respect to the second welfare test criteria as presented by Atkinson--the test of inequality-aversion, use of the variance implies increasing inequality-aversion in the sense that one distribution may indicate a much greater relative variation than another but may yield a smaller variance by virtue of a smaller mean. It is not certain that this property

---

[1]For grouped data the relative mean deviation is defined as:

$$RMD = \sum_{j=1}^{m} n_j \left| Y_j/n_j - \mu \right| / Y$$

where the number of groups is m, the number of individuals in the j-th group is n_j, the total income accruing to the j-th group is Y_j, the total income accruing to all groups in Y, and the mean level of income for all groups is μ.

[2]Sen, <u>On Economic Inequality</u>, p.27.

is desirable. Sen views it as a deficiency of the variance as a measure of inequality.[1]

The Coefficient of Variation

The coefficient of variation is the square root of the variance divided by the mean level of income and is defined as:[2]

$$COV = V^{1/2}/\mu$$

The coefficient of variation is sensitive to transfers of income from richer to poorer at any income level. In fact, it can be demonstrated that the coefficient of variation is equally sensitive to transfers at all levels. Thus, a transfer from an individual earning \$5,000 to another earning \$4,000 is considered to be the same as a similar transfer between an earner of \$50,000 and an earner of \$49,000. Because it is commonly argued that more weight should be attached to transfers at the lower end of the income scale, the coefficient of variation should be considered lacking as a proper measure of income inequality.

Finally, since the coefficient of variation is defined relative to the mean, it exhibits the property of constant inequality-aversion and does not change with proportional increases in all incomes.[3]

---

[1]Ibid., p.27.

[2]Ibid.

[3]For grouped data calculation of the variance and the coefficient of variation, the variance is defined as:

$$V = \frac{1}{n} \sum_{j=1}^{m} n_j \, (Y_j/n_j - \mu)^2$$

where the number of groups is m, the number of individuals in the jth group is n_j, the number of individuals in all groups is n, the total income accruing to the jth group is Y_j, and the mean level of income for all groups is μ. The coefficient of variation is thus the square root of the grouped variance divided by the mean.

The Standard Deviation of Logarithms

The standard deviation of logarithms is defined as follows:[1]

$$SDL = \sqrt{\sum_{i=1}^{n} (\log\mu - \log Y_i)^2/n}$$

Like the coefficient of variation the standard deviation of logarithms exhibits constant inequality-aversion and is sensitive to income transfers at all levels. The advantage of the standard deviation of logarithms is, however, that transfers at the lower end of the income scale are weighted more heavily than at the upper end of the income scale. Indeed, as income transfers occur at higher levels, the first consideration may even be violated.[2] Thus, high level income transfers from richer to poorer may negatively influence the standard deviation of logarithms. As such, the validity of the measure is open to question.

The Gini Coefficient

Perhaps the most widely used measure of income inequality is the Gini coefficient. A property which is desirable and which none of the other measures exhibits is that the Gini coefficient is a direct measure of income differences, in that it takes note of differences between every pair of incomes rather than between every income and the mean. This

---

[1] Sen, On Economic Inequality, p.29.

[2] Ibid., p.32.

is demonstrated by the feature that the Gini coefficient can be computed by taking one-half the relative mean difference which is defined as the arithmetic average of the absolute difference between all pairs of income. As an alternative to the Lorenz computation,[1] the Gini coefficient can be defined as:[2]

$$GC = [1/(2n^2\mu)] \cdot [\sum_{i=1}^{n} \sum_{j=1}^{n} Y_i - Y_j \;]$$

The Gini coefficient will always fall between zero and one. Zero implies perfect equality while one implies that one person receives all the income. Thus, the smaller the Gini coefficient, the more equal the distribution of income.

With respect to the first welfare consideration, the principle of transfers, the Gini coefficient is sensitive to transfers of income from rich to poor at all income levels, with emphasis on transfers in the middle income range.[3] Insofar as the second consideration is concerned, it exhibits constant inequality-aversion.[4]

In recent years much debate has taken place with respect to the welfare implications of the Gini coefficient

---

[1]For a linear approximation of the Gini coefficient using grouped cumulative percentage data the Gini coefficient is defined as:

$$GC = 1 - [\sum_{i=1}^{m} 1/2\ (R_{i+1} - R_i)(Y_{i+1} + Y_i)] \Big/ 5000$$

where R_i is the cumulative percentage of individuals in the i-th lowest income group, Y_i is the cumulative percentage of total income accruing to the i-th lowest income group, $Y_1 = R_1 = 0$, and the number of groups is m-1.

[2]Sen, <u>On Economic Inequality</u>, p.31

[3]Atkinson, p.256.

[4]Ibid.,

ranking of income distributions. In 1970 Atkinson showed that a utility function which will rank income distributions differently than the Gini coefficient can always be found when the Lorenz curves intersect.[1] It has subsequently been shown by Newbery[2]; Dasgupta, Sen and Starrett[3]; and by Rothchild and Stiglitz[4] that the Gini coefficient ranking of income distributions is reflected only in a form of social welfare function which appears to be somewhat restrictive in nature.

Summary

It has been suggested that a proper measure of income distribution will rank income distributions according to the overall level of social welfare associated with each level and distribution of income. As such, a proper measure of income distribution should reflect the character of the underlying social welfare function. However, since the specification of the social welfare function remains uncertain, the proper measure of the distribution of income remains unknown.

In the absence of a properly defined welfare significant measure of income distribution, it is necessary to turn

---

[1]Ibid., pp.244-249.

[2]David Newbery, "A Theorem on the Measurement of Inequality", Journal of Economic Theory 2 (September 1970): 264-265.

[3]Dasgupta, Sen and Starret, "Notes on the Measurement of Inequality".

[4]Rothchild and Stiglitz, "Some Further Results on the Measurement of Inequality".

to the conventional measures of income inequality. The choice of measure to be used in any analysis of income distribution should be based upon the welfare implications of the alternative measures of income inequality and the analyst's or policy maker's conception of what welfare criteria are relevant. As such, the choice of measure is essentially normative.

In recent years legitimate criticism has been made of the Gini coefficient in terms of its welfare implications. The criticism has resulted from the restrictive nature of the social welfare function this statistic reflects and its tendency to weight transfers in the middle income range more heavily than at the ends. The advantage of the Gini coefficient, however, is its ability to properly record income transfers from richer to poorer persons. The absence of this desirable property excludes the range (which ignores transfers at any level within the extremes), the relative mean deviation (which ignores transfers on the same side of the mean) and the standard deviation of logarithms (which may improperly record transfers in the upper income groups). A further advantage[1] of the Gini coefficient is that this statistic exhibits constant inequality-aversion, a property which excludes the variance. Thus, the best choice for a measure of income inequality, despite its imperfections, appears to be the Gini coefficient.

---

[1]It should be noted that whether constant, increasing, or decreasing inequality-aversion is considered an advantage of a measure of inequality, is a normatively determined consideration. Thus, legitimate arguments in favour of each can be made.

CHAPTER IV

THE ESTIMATION OF 1970 ALBERTA FARM INCOME

This study focuses on the level and distribution of farm income in Alberta in 1970. The measurement of income inequality in Alberta agriculture using the Gini coefficient technique requires the collection of farm income and expense data by economic class. The data for the study were compiled from the 1971 Census of Agriculture in combination with the Agriculture Division of Statistics Canada estimates of farm income[1] in Alberta for that year. A number of other secondary sources were used. This chapter outlines the nature of the data and the methods of estimation of 1970 farm income in Alberta.

Census Data Problems

The use of census data introduces a number of problems. In the first place, the data must be considered somewhat suspect by virtue of probable error in reporting actual values. Since there is no compulsion to report values accurately, it

---

[1]Statistics Canada, Agriculture Division, Net Farm Income 1972, Cat. No. 21-202 (Ottawa: Statistics Canada, June, 1973).

is doubtful that a great deal of precision is provided by farm operators when responding to the census questionaires, even though confidentiality is guaranteed. Second, due to the extremely broad nature of some of the questions, and the complete absence of others, certain information which is desirable from the point of view of this study is not available. Finally, for reasons of confidentiality, certain desired information is made unavailable by census authorities. This is especially true with respect to detailed cross-classifications of data at the census division level. A preferred source of information is likely to be direct income tax data, since the compulsory nature of tax information ensures a greater degree of accuracy in reporting. Also, the tax information recorded on computer tape in recent years is much more complete than comparable census sources, especially with respect to off-farm income data and farm expenses, including depreciation. Further, the annual collection of tax data facilitates study of income distribution on a time series basis. Although it is conceded that the data are more likely to lose those operators in extremely low income brackets or those actually showing losses, than is the census, it is considered that this problem is minimized by the requirement that in order to average income over a period of years, income tax forms must be filed in each of the averaging years. Thus, income tax data could provide more accurate, complete and up to date information regarding the level and distribution of farm incomes. However, since income tax data were not

available at the time of this study, for reasons of confidentiality, census data appeared to be the next best alternative.

The Estimation of Farm Income

Gross Farm Cash Income

The 1971 Census of Agriculture defines a census-farm as "a farm, ranch or other agricultural holding of one acre or more with sales of agricultural products, during the 12-month period prior to the census of $50 or more."[1] The economic classification of census-farms excluding institutional farms, is arrived at by dividing census-farms into twelve gross farm cash income classes. Gross farm cash income includes income from sales of agricultural products during 1970, cash advances on stored grain, deficiency payments, patronage dividends and items such as LIFT and PFAA payments and crop insurance. For the purpose of the study, it was decided to drop from the analysis the "$50-249 (or no sales)" gross farm cash income group, on the basis that such farms are not bona fide farm operations. Further, for the study, a number of economic classes are aggregated in order to simplify analysis and presentation, and in such a manner as to leave the percentage of operators in the lower income groups approximately equal to each other. As a result, the number of economic classes is reduced to seven. All further reference in this study to economic classes is made to these seven economic classes alone, unless otherwise stated. The seven classes and the number of

[1] Statistics Canada, 1971 Census of Canada, Vol. IV, Agriculture, Part 3, Alberta.

operators in each are presented for Alberta and each of the fifteen Alberta census divisions in Table A.1 in Appendix A.

Classifying the value of gross farm cash income by economic class, on both a provincial and census division basis, yields a distribution of total gross farm cash income both provincially and on a census division level. According to the Census of Agriculture for Alberta, in 1970 the value of gross farm cash income accruing to Alberta farmers in all relevant economic groups combined amounted to $829,223,420. If institutional farms and farms in the omitted group are included the figure increases to $832,558,420. The former value as a portion of the latter represents approximately 99.6 percent.[1] Corresponding to the latter figure is the estimate of cash farm receipts plus supplementary payments accruing to Alberta farmers made by the Agriculture Division of Statistics Canada[2] for 1970--$715,344,000. Since the portion relevant to the study is 99.6 percent, the value based on the Statistics Canada estimate[3] relevant to the study is $712,478,528. Distributing this value among the seven economic classes according to the census distribution both on the provincial and census division levels, yields

---

[1]The exact value used in calculation was 99.5994275 percent for Alberta.

[2]Statistics Canada, Agriculture Division, Net Farm Income 1972, Cat. No. 21-202 (Ottawa: Statistics Canada, June, 1973), p.7.

[3]The term "Statistics Canada" estimates hereafter refer to the estimates made by Statistics Canada, Agriculture Division, Net Farm Income 1972, Cat. No. 21-202 (Ottawa: Statistics Canada, June, 1973). These estimates are for gross farm income, farm expenses, and income in kind.

rebased estimates of gross farm cash income accruing to the various economic classes. Thus, although the absolute values in each classification are rebased to correspond to the overall Statistics Canada estimate, the distribution among census divisions and among economic classes remains entirely that of the Census of Agriculture. The rebased estimates of gross farm income--hereafter referred to as gross farm cash income--by economic class are presented in Table A.1 of Appendix A, for Alberta and the census divisions.

The rationale for rebasing the census estimate of gross farm cash income to correspond with the Statistics Canada estimate is the acknowledgement by census authorities that the census estimates of farm income do not coincide with cash income figures published by the Agriculture Division of Statistics Canada, and that users of census material exercise caution in adopting census farm income estimates--the implication being that census figures are likely to be less precise. As a result, all census gross farm cash income figures are rebased downward to correspond with the Statistics Canada base.

Farm Expenses

It is suspected that the Statistics Canada estimates of gross farm cash income and farm expenses are in better alignment than are the corresponding census gross farm cash income and cost valuations. The problem appears to be in an overestimation of gross incomes and underestimation of costs

on the part of census data. Included in census costs are cash wages paid to hired agricultural labour; property, municipal, and school taxes; agricultural property rent; farm fuel and oil expenses; machine rental, custom or contract work expenses; and expenses on commercial fertilizers (excluding lime) and agricultural chemicals. For Alberta as a whole including institutional farms and farms in the omitted group, operating expenses as defined amounted to $243,544,570. If only the groups relevant to the study are considered, the figure becomes $238,980,630. The latter value represents approximately 98.1 percent[1] of the former. The value corresponding to the former figure as estimated by Statistics Canada appears to be significantly greater--$456,191,000.[2] Since the Statistics Canada farm cost estimates include a number of important items not included in the census such as interest on indebtness, machinery repairs and other machinery expenses, other crop expenses, livestock expenses, building repairs, electricity and telephone expenses, and miscellaneous farm expenses, it appears that the Statistics Canada income-cost relationship may better describe the net position of Alberta farmers. The census cost estimates are, therefore, adjusted in line with the Statistics Canada cost estimates.

---

[1]The exact value used in calculation was 98.126035 percent for Alberta.

[2]Statistics Canada, Agriculture Division, Net Farm Income 1972, p.11.

The method of estimating operating expenses for the purpose of the study is similar to the method for estimating gross farm cash income. The value corresponding to the Census of Agriculture estimate of operating expenses for the relevant economic groups is 98.1 percent of $456,191,000 or approximately $447,642,140. This value is distributed among census divisions and economic classes according to the distribution of operating expenses determined by the census.

In the computation of net farm income by the Agriculture Division of Statistics Canada, depreciation on land and buildings and depreciation on machinery and equipment are included as items of expense. Since the Census of Agriculture does not include depreciation, the distribution of this expense cannot be obtained directly. However, the census does provide a distribution among census divisions and economic classes of the value of land and buildings and the value of machinery and equipment. According to the Census of Agriculture, the total value of land and buildings on census farms in Alberta in 1970 amounted to $3,530,252,200. Depreciation on buildings for the same year according to Statistics Canada estimates amounted to $33,121,000. It thus appears that a proxy for the rate of depreciation on buildings can be taken as slightly less than 1 percent.[1] Applying this factor to the value of buildings and land as distributed among census divisions and economic classes yielded a proxy for the distribu-

[1]The exact value used in calculation was 0.938204925 percent.

tion of depreciation on buildings as a farm expense. Similarily, the value of machinery and equipment reported by the census was $867,446,000, while Statistics Canada estimated depreciation on machinery and equipment for 1970 to be $90,678,000. The rate of depreciation on machinery and equipment thus appears to be slightly greater than 10 percent.[1] Applying this factor to the census distribution of the value of machinery and equipment with respect to the various classifications yielded a distribution of total depreciation. A further summation of total depreciation and total operating expenses provided a distribution of total expenses for use in the computation of net income distributions. The distribution of total expenses among economic classes for the province and census divisions in 1970 is presented in Table A.1.

Net Farm Income

With some manipulation of the Census of Agricultural data, distributions among census divisions and economic classes can be determined for both gross farm cash income and total farm expenses. Assuming that within any economic class, all operators hold identical income-cost positions and hence there occurs no inter-group shifting of farm

---

[1]The exact value used in calculation was 10.4534461 percent.

operations, it is legitimate to derive net farm income distributions. It should be noted that the relative positions of the original economic classes as defined in terms of gross farm cash income intervals, may possibly shift in net income terms. Thus, for instance, farm operators who fall into a relatively high gross farm cash income class may conceivably fit into a relatively lower net income class due to a higher than usual cost-income situation. It is necessary, in such a case, to re-order the classes on the basis of group average net income values, especially within the context of Gini coefficient analysis. The 1970 distribution of net farm cash income among economic classes for the province and the census divisions is presented in Table A.1 of Appendix A.

Non Farm Income Accruing to Farm Operations

In order to arrive at a more inclusive picture of the level and distribution of 1970 farm income in Alberta it is necessary to include a measure of non-farm income. For this purpose two items of information are available for inclusion in the income estimates: income in kind and off-farm labour income. Investment income is desirable from the point of view of assessing overall income positions, but since neither the size nor the distribution of this component of total income is available, it is by necessity excluded.

Income in Kind

Statistics Canada estimates that income in kind accruing to all Alberta farm operations in 1970 amounted to approx-

imately $95,536,000, a figure representing 13.355 percent of total gross farm cash income. The portion relevant to the groups included in the study is 99.6 percent of income in kind for the province, or $95,151,507. Since the Census of Agriculture does not include income in kind, the distribution of this item can not be determined directly from the census. Farm income in kind as defined by Statistics Canada represents the value of consumption of home-grown wool, forest and food products and an imputed rental value of farm dwellings, the latter representing in 1970 approximately 81 percent of total income in kind. It is assumed that, first, for each census division, income in kind is equal to 13.355 percent of the gross farm cash income accruing to that census division. Secondly, income in kind accruing to each farm operation within the census division is assumed equivalent. Hence, the total income in kind within each census division is distributed among economic classes according to the number of farm operations in each class. Similarily, the distribution of farm income in kind for the province as a whole is based on the number of farm operations falling in each of the economic classes. The distributions of income in kind and both gross and net farm cash income plus income in kind among economic classes are presented in Table A.1 of Appendix A, for Alberta and each of the census divisions.

Off-Farm Labour Income

Off-farm labour income is estimated and distributed

using a more direct approach. The Census of Agriculture reports the number of days worked off-farm by type of work, economic class and census division. Thus, by assigning appropriate daily wage rates, a value distribution for off-farm labour income is derived for economic classes and census divisions. The type of off-farm labour is differentiated into five categories: agricultural work off the holding; logging, lumbering or forestry work; truck or bus driving; operation of road maintenance or construction equipment; and "other" work. Respectively, the wage rates assigned were: \$13.00,[1] \$27.52,[2] \$26.16,[3] \$28.00,[4] \$25.63.[5] The distributions of off-farm labour income, gross farm cash income plus off-farm labour income, and net farm cash income plus off-farm labour income are presented in Table A.1 of Appendix A for the province and each of the census divisions.

---

[1]This value is the "without board" average of daily Alberta farm wage rates reported by Statistics Canada, Agriculture Division, Farm Wages in Canada, Cat. No. 21-022 (Ottawa: Statistics Canada, January, May, August, 1972).

[2]This value is the average weekly wage for forestry workers in Canada divided by five, assuming a five day work week. The average weekly wage is reported by Statistics Canada, Canada Year Book 1972 (Ottawa: Statistics Canada, 1972), p.843.

[3]This value is the average weekly wage for truck transport workers in Alberta divided by five, assuming a five day work week. The average weekly wage is reported by Statistics Canada, Review of Employment and Average Weekly Wages and Salaries 1968-70, Cat. No. 72-201 (Ottawa: Dominion Bureau of Statistics, March, 1972), p.106.

[4]This value is the average of average weekly wages for road maintenance workers and for construction (general contracting) workers in Alberta divided by five, assuming a five day work week. The average weekly wages are reported by Statistics Canada, Review of Employment and Average Weekly Wages and Salaries 1968-70, p.106.

[5]This value is the industrial composite of average weekly wages in Alberta divided by five, assuming a five day work week. The average weekly wage is reported by Statistics Canada, Review of Employment and Average Weekly Wages and Salaries 1968-70, p.107.

Remaining Data

In order to use Gini coefficient techniques, it is necessary to re-order economic classes wherever appropriate by examination of class income averages. The class averages for the various definitions of income, both gross and net, are presented for Alberta and each of the census division in Table A.2 of Appendix A. The appropriately ranked class cumulative percentage distributions of income paired with the proper cumulative percentage distributions of farm operations are presented in Table A.3 of Appendix A. These distributions are used in the calculation of Gini coefficients.

Finally, in order to establish the basis for trends which appear in the analysis, it is necessary to examine the economic characteristics of census farms with respect to economic class and census division. Some economic characteristics of census farms in Alberta in 1970 are presented by economic class in Tables B.1 and B.2 of Appendix B, for each of the census divisions.

Summary

The 1971 Census of Agriculture appears to present a distorted view of the 1970 level of farm income in Alberta. Problems with this source of data are an overestimation of gross farm income and underestimation of farm expenses (with reference to later Statistics Canada estimates) and the exclusion of a number of interesting off-farm income components. It is believed that taxation data would provide a more

[illegible]

accurate base for a study of the level and distribution of farm income. However since taxation data are not generally available, census data with some modification appear to be the next best alternative. As a result, a number of manipulations were made on the census data in order to arrive at "better" estimates of 1970 farm income in Alberta. The new estimates were then used in an analysis of the level and distribution of Alberta farm income among census divisions for 1970. Gini coefficients for the various measures of farm income were estimated. The results of these calculations are reported and discussed in Chapter V.

CHAPTER V

ALBERTA FARM INCOME INEQUALITY IN 1970

In the preceeding chapter a number of manipulations to the 1971 Census of Agriculture data were outlined. From the modified data it is possible to derive a number of different definitions of farm income. With each definition of farm income are associated distinct distributional characteristics both within and among census divisions. The purpose of this chapter is to quantitatively measure the level and distribution of 1970 Alberta farm income within and among census divisions and according to the various definitions of farm income, and on a comparative basis to analyse the quantitative results.

The Definition of Income

1970 Alberta farm income inequality computations are made on the basis of a number of different definitions of both gross and net farm income. The definitions of gross farm income are: gross farm cash income (G), gross farm cash income plus off-farm labour income (G_L), gross farm cash income plus income in kind (G_K), and gross farm cash income plus off-farm labour income plus income in kind (G_{LK}).

Similarily, the estimates of net farm income are: net farm cash income (N), net farm cash income plus off-farm labour income (N_L), net farm cash income plus income in kind (N_K), and net farm cash income plus off-farm labour income plus income in kind (N_{LK}). The value and cumulative percentage distributions of farm income as variously defined, by economic class[1] and census division are presented in Tables A.1 and A.3 of the Appendix.

The Measures of Income Inequality

The measures of income inequality which are computed include the Gini coefficient, the relative mean deviation, the variance, the coefficient of variation and the standard deviation of logarithms. The emphasis for analytical purposes is placed upon the Gini coefficient. In some cases, however, the Gini coefficient cannot be computed.[2] This occurs whenever the net farm income accruing to one or more of the economic classes is negative. When this happens, the standard deviation of logarithms can not be calculated either. Under such circumstances the Lorenz curve describing the distribution passes beneath the horizontal axis into the negative

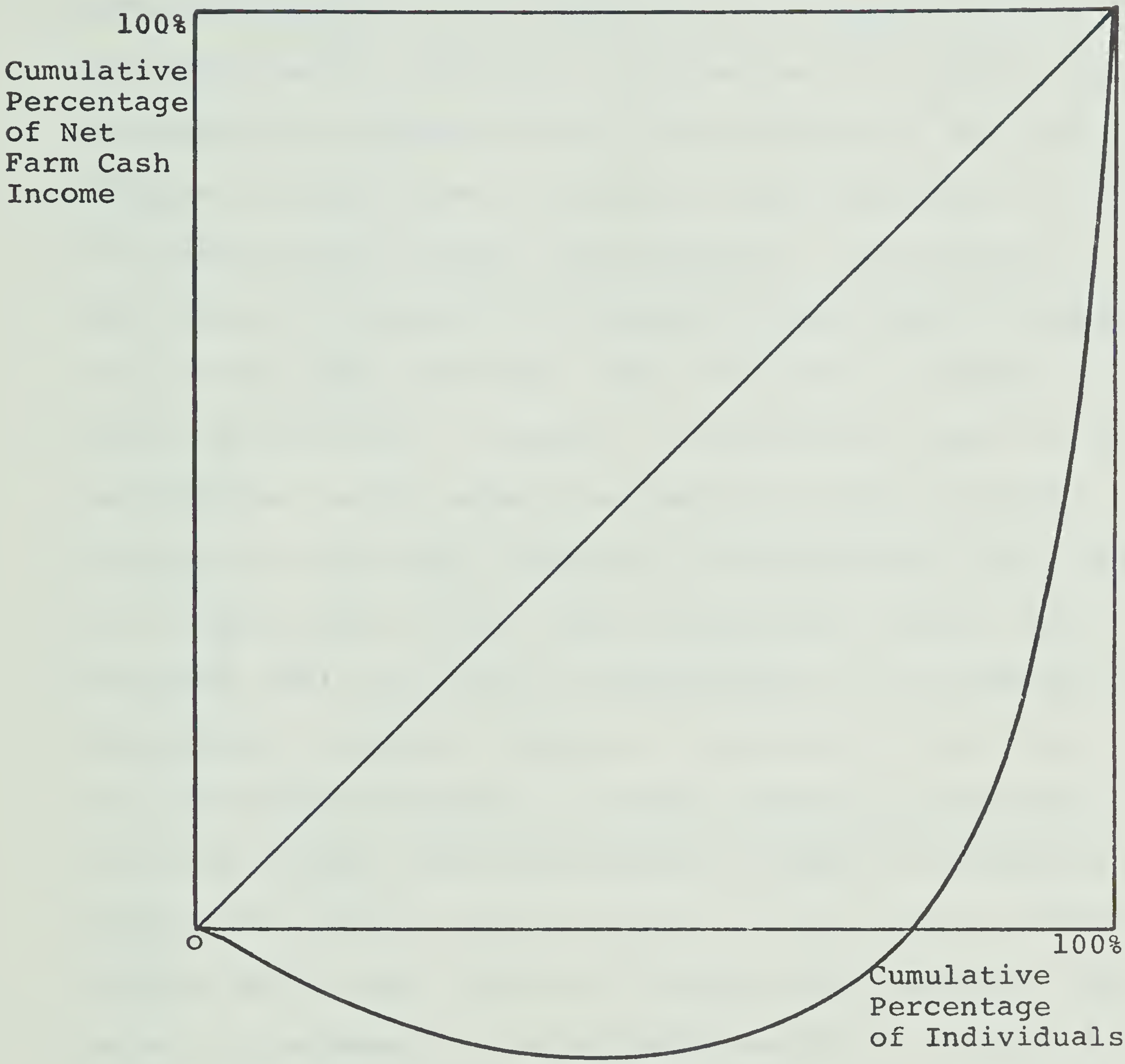
[1]The term "economic class", with respect to the value distribution of farm income, refers to the seven economic classes described in Chapter IV, presented in ascending order. With respect to the cumulative percentage distributions, however, the term 'economic class' refers to the seven economic classes presented in ascending order of class income averages.

[2]It is possible to arbitrarily make all economic classes exhibit positive incomes by adding a constant value to all economic classes in all census divisions. However, it is not clear what the distributional impact will be on Gini coefficients.

FIGURE 5.1

THE CASE OF NEGATIVE NET FARM

CASH INCOMES IN CENSUS DIVISION SIX



cumulative income zone. The case of negative net farm cash incomes in census division 6 is illustrated in Figure 5.1.

Since no test exists by which to discern whether size differences between Gini coefficients are significant in the statistical sense, emphasis is placed upon the ranking of distributions according to the relative size of the Gini coefficients, rather than on absolute size differences of the Gini coefficients between distributions. The analysis of farm income distribution in Alberta is thus based on comparisons, using where possible, Gini coefficient rankings of income distributions. However, as pointed out above, Gini coefficients are not always available and hence complete rankings are not always possible on the basis of Gini coefficient comparisons. Under such circumstances--which occur frequently when net income is considered--it is necessary to interpolate a complete ranking on the basis of the "next best" alternative measure of income inequality available. The choice of the next best measure is made on the basis of choosing that measure which appears to most closely resemble the Gini coefficient ranking of income distributions. This choice is discussed in the following section. In Table 5.1 the results of the calculations of the various measures of income inequality are presented for each of the census divisions and the province as a whole. In Table 5.2, using the various measures of income inequality, the census divisions are ranked from the most equal income distribution to the most unequal income distribution.

TABLE 5.1.1

SUMMARY MEASURES OF THE 1970 DISTRIBUTION OF FARM INCOME IN ALBERTA BY CENSUS DIVISION AND DEFINITION OF FARM INCOME

(GROSS FARM CASH INCOME)

Census Division	Gini Coefficient	Relative Mean Deviation	Variance	Coefficient of Variation	Standard Deviation of Logarithms
1	.5497	.8012	649,690,051	1.4613	.2756
2	.6472	1.0194	2,181,451,746	1.7242	.4468
3	.6228	.9740	1,271,519,956	1.5834	.4099
4	.4804	.7122	246,369,328	1.1551	.1992
5	.5236	.7800	566,905,903	1.2539	.2516
6	.6150	.9452	819,922,417	1.4919	.4329
7	.5071	.7502	252,154,867	1.2170	.2357
8	.5902	.8840	372,949,384	1.5612	.3401
9	.6729	1.0918	596,688,965	1.5391	.7068
10	.5226	.7742	138,660,760	1.3689	.2419
11	.5977	.9000	218,525,353	1.5912	.3546
12	.5027	.7146	61,485,760	1.3677	.2161
13	.5495	.8104	136,354,779	1.5808	.2566
14	.5484	.8396	49,803,316	1.5774	.2394
15	.5010	.7222	56,666,393	1.3010	.2168
Alberta	.6059	.9096	430,465,050	1.7095	.3528

TABLE 5.1.2

SUMMARY MEASURES OF THE 1970 DISTRIBUTION OF FARM INCOME IN ALBERTA BY CENSUS DIVISION AND DEFINITION OF FARM INCOME

(GROSS FARM CASH INCOME PLUS INCOME IN KIND)

Census Division	Gini Coefficient	Relative Mean Deviation	Variance	Coefficient of Variation	Standard Deviation of Logarithms
1	.4850	.7068	649,909,546	1.2893	.1578
2	.5709	.8992	2,181,405,040	1.5210	.2329
3	.5494	.8592	1,271,580,337	1.3969	.2170
4	.4239	.6284	246,397,735	1.0190	.1218
5	.4619	.6882	566,735,990	1.1060	.1468
6	.5425	.8340	819,756,874	1.3160	.2214
7	.4474	.6618	252,187,966	1.0737	.1390
8	.5206	.7798	372,923,347	1.3772	.1894
9	.5936	.9630	596,636,665	1.3577	.3099
10	.4610	.6830	138,634,929	1.2075	.1460
11	.5272	.7938	218,564,849	1.4038	.1998
12	.4434	.6304	61,449,865	1.2062	.1361
13	.4846	.7148	136,302,713	1.3943	.1563
14	.4838	.7408	49,825,862	1.3920	.1546
15	.4420	.6372	56,671,901	1.1477	.1366
Alberta	.5345	.8024	430,316,452	1.5078	.1964

TABLE 5.1.3

SUMMARY MEASURES OF THE 1970 DISTRIBUTION OF FARM INCOME IN ALBERTA BY CENSUS DIVISION AND DEFINITION OF FARM INCOME

(GROSS FARM CASH INCOME PLUS OFF-FARM LABOUR INCOME)

Census Division	Gini Coefficient	Relative Mean Deviation	Variance	Coefficient of Variation	Standard Deviation of Logarithms
1	.5019	.7514	632,262,127	1.3734	.1586
2	.6109	.9726	2,151,910,537	1.6538	.2841
3	.5775	.9150	1,243,302,588	1.4938	.2467
4	.4447	.6646	239,540,887	1.0901	.1323
5	.4885	.7390	551,592,851	1.1915	.1641
6	.5550	.8708	791,663,639	1.3827	.2204
7	.4586	.6868	243,308,807	1.1313	.1363
8	.5070	.7768	357,106,900	1.4003	.1561
9	.5945	.9816	569,107,849	1.3783	.3007
10	.4335	.6564	130,846,197	1.1968	.1088
11	.4603	.7066	203,678,908	1.3073	.1195
12	.3663	.5258	55,805,267	1.0830	.0734
13	.4327	.6554	129,214,848	1.3261	.1028
14	.3259	.5084	43,133,256	1.0562	.0552
15	.3360	.4824	49,925,214	.9407	.0620
Alberta	.5207	.7998	414,899,645	1.5307	.1639

TABLE 5.1.4

SUMMARY MEASURES OF THE 1970 DISTRIBUTION OF FARM INCOME IN ALBERTA BY CENSUS DIVISION AND DEFINITION OF FARM INCOME

(GROSS FARM CASH INCOME PLUS OFF-FARM LABOUR INCOME PLUS INCOME IN KIND)

Census Division	Gini Coefficient	Relative Mean Deviation	Variance	Coefficient of Variation	Standard Deviation of Logarithms
1	.4452	.6666	632,477,086	1.2185	.1130
2	.5411	.8616	2,152,255,926	1.4650	.1865
3	.5122	.8116	1,243,477,929	1.3250	.1649
4	.3942	.5892	239,505,712	.9665	.0932
5	.4328	.6548	551,542,701	1.0556	.1139
6	.4929	.7734	791,609,626	1.2280	.1510
7	.4212	.6898	254,527,009	1.0272	.1081
8	.4519	.6938	357,299,499	1.2479	.1141
9	.5296	.8744	569,060,634	1.2279	.1970
10	.3870	.5860	130,897,610	1.0686	.0821
11	.4133	.6346	203,672,180	1.1738	.0919
12	.3296	.4732	55,768,740	.9744	.0581
13	.3881	.5878	129,269,147	1.1895	.0794
14	.2968	.4638	43,167,929	.9641	.0463
15	.3046	.4374	49,927,371	.8530	.0502
Alberta	.4641	.7128	179,340,377	1.3641	.1190

TABLE 5.1.5

SUMMARY MEASURES OF THE 1970 DISTRIBUTION OF FARM INCOME IN ALBERTA BY CENSUS DIVISION AND DEFINITION OF FARM INCOME

(NET FARM CASH INCOME)

Census Division	Gini Coefficient	Relative Mean Deviation	Variance	Coefficient of Variation	Standard Deviation of Logarithms
1	--	1.0500	106,667,343	2.0117	--
2	--	1.5126	435,528,876	2.6035	--
3	--	1.4128	258,352,878	2.3915	--
4	--	.9934	32,538,224	1.5701	--
5	--	1.3660	79,585,211	2.1737	--
6	--	1.5634	130,570,111	2.5292	--
7	--	1.2488	59,728,637	2.2499	--
8	--	1.4224	21,340,295	1.5612	--
9[a]	--	1.1526	6,896,158	1.8770	--
10	--	1.9004	25,716,993	3.7316	--
11	--	3.9018	9,955,388	5.6545	--
12	--	4.6910	12,386,760	11.3167	--
13	--	2.1928	26,938,340	4.6053	--
14[a]	--	9.9000	4,698,608	16.5468	--
15[a]	--	4.8400	6,808,058	10.9173	--
Alberta	--	1.6886	70,648,625	3.4251	--

TABLE 5.1.6

SUMMARY MEASURES OF THE 1970 DISTRIBUTION OF FARM INCOME IN ALBERTA BY CENSUS DIVISION AND DEFINITION OF FARM INCOME

(NET FARM CASH INCOME PLUS INCOME IN KIND)

Census Division	Gini Coefficient	Relative Mean Deviation	Variance	Coefficient of Variation	Standard Deviation of Logarithms
1	.5059	.7224	106,691,725	1.3839	.1854
2	.6160	1.0422	435,530,969	1.7938	.2766
3	.6035	.9760	258,319,408	1.6520	.2638
4	.4450	.6626	32,544,018	1.0471	.1474
5	.5457	.8444	79,595,206	1.3436	.2272
6	.6391	.9976	130,580,113	1.6138	.4219
7	.5573	.8286	59,736,815	1.4927	.2520
8	.6144	.9128	67,607,661	1.7832	.3498
9	--	2.2400	6,901,138	3.6486	--
10	--	1.0298	25,720,232	2.0221	--
11	--	1.2110	9,967,882	1.7550	--
12	--	1.3556	12,397,020	3.2692	--
13	--	1.1690	26,916,956	2.4554	--
14	--	2.7672	4,664,164	4.6345	--
15	--	2.1682	6,794,272	4.8812	--
Alberta	.6707	1.0152	70,057,231	2.0585	.5117

TABLE 5.1.7

SUMMARY MEASURES OF THE 1970 DISTRIBUTION OF FARM INCOME IN ALBERTA BY CENSUS DIVISION AND DEFINITION OF FARM INCOME

(NET FARM CASH INCOME PLUS OFF-FARM LABOUR INCOME)

Census Division	Gini Coefficient	Relative Mean Deviation	Variance	Coefficient of Variation	Standard Deviation of Logarithms
1	.5638	.8620	100,130,325	1.6678	.2098
2	.7574	1.3366	424,360,692	2.2948	.7231
3	.7048	1.1732	247,130,778	2.0139	.4724
4	.5205	.7936	30,059,727	1.2922	.2061
5	.6915	1.1110	74,510,951	1.7879	.6979
6	.7176	1.1702	120,531,933	1.9349	.6866
7	.6236	.9512	56,283,728	1.7969	.3099
8	.5928	.9368	62,043,616	1.9292	.2252
9	--	59.0506	10,104,565	83.6518	--
10	.6119	.9532	23,075,891	2.0750	.2694
11	.4471	.7194	6,678,208	1.1827	.1134
12	.4947	.7864	10,663,495	2.2109	.1404
13	.5748	.9096	24,394,025	2.1363	.2000
14	.2763	.4442	2,758,394	1.0297	.0419
15	.3217	.5036	5,247,294	1.5415	.0531
Alberta	.6560	1.0326	64,925,833	2.2290	.3115

TABLE 5.1.8

SUMMARY MEASURES OF THE 1970 DISTRIBUTION OF FARM INCOME IN ALBERTA BY CENSUS DIVISION AND DEFINITION OF FARM INCOME

(NET FARM CASH INCOME PLUS OFF-FARM LABOUR INCOME PLUS INCOME IN KIND)

Census Division	Gini Coefficient	Relative Mean Deviation	Variance	Coefficient of Variation	Standard Deviation of Logarithms
1	.4061	.6208	100,134,059	1.2013	.0879
2	.5398	.9526	424,266,951	1.6354	.1779
3	.5088	.8468	247,157,338	1.4538	.1533
4	.3646	.5558	30,075,942	.9053	.0746
5	.4534	.7286	74,533,119	1.1724	.1188
6	.4943	.8062	120,501,242	1.3327	.1437
7	.4399	.6710	56,288,897	1.2678	.1057
8	.4211	.6670	62,069,079	1.3737	.0924
9	--	1.0414	10,159,284	1.4770	--
10	.4090	.6372	23,088,060	1.3871	.0862
11	.2852	.4588	6,679,043	.7543	.0448
12	.3258	.5178	10,656,682	1.4554	.0530
13	.4030	.6376	24,392,804	1.4975	.0805
14	.2016	.3242	2,761,757	.7520	.0253
15	.2116	.3312	5,244,629	1.0138	.0262
Alberta	.4628	.7132	65,308,554	1.5434	.1170

Note: A blank space denotes negative income groups and hence non calculation of the Gini coefficient and standard deviation of logarithms. [a]Total net farm cash income accruing to the census division is negative. As a reuslt, inequality is measured in terms of inequality of losses.

TABLE 5.2.1

RANKINGS OF CENSUS DIVISIONS FROM MOST EQUAL DISTRIBUTION OF INCOME TO LEAST EQUAL, BY MEASURE OF INEQUALITY AND DEFINITION OF FARM INCOME. (GROSS FARM CASH INCOME)

Rank Position	Gini Coefficient	Relative Mean Deviation	Variance	Coefficient of Variation	Standard Deviation of Logarithms
1	4	4	14	4	4
2	15	12	15	7	12
3	12	15	12	5	15
4	7	7	13	15	7
5	10	10	10	12	14
6	5	5	11	10	10
7	14	1	4	1	5
8	13	13	7	6	13
9	1	14	8	9	1
10	8	8	5	8	8
11	11	11	9	14	11
12	6	6	1	13	3
13	3	3	6	3	6
14	2	2	3	11	2
15	9	9	2	2	9

TABLE 5.2.2

RANKINGS OF CENSUS DIVISIONS FROM MOST EQUAL DISTRIBUTION OF INCOME TO LEAST EQUAL, BY MEASURE OF INEQUALITY AND DEFINITION OF FARM INCOME.

(GROSS FARM CASH INCOME PLUS INCOME IN KIND)

Rank Position	Gini Coefficient	Relative Mean Deviation	Variance	Coefficient of Variation	Standard Deviation of Logarithms
1	4	4	14	4	4
2	15	12	15	7	12
3	12	15	12	5	15
4	7	7	13	15	7
5	10	10	10	12	10
6	5	5	11	10	5
7	14	1	4	1	14
8	13	13	7	6	13
9	1	14	8	9	1
10	8	8	5	8	8
11	11	11	9	14	11
12	6	6	1	13	3
13	3	3	6	3	6
14	2	2	3	11	2
15	9	9	2	2	9

TABLE 5.2.3

RANKINGS OF CENSUS DIVISIONS FROM MOST EQUAL DISTRIBUTION OF INCOME TO LEAST EQUAL, BY MEASURE OF INEQUALITY AND DEFINITION OF FARM INCOME

(GROSS FARM CASH INCOME PLUS OFF-FARM LABOUR INCOME)

Rank Position	Gini Coefficient	Relative Mean Deviation	Variance	Coefficient of Variation	Standard Deviation of Logarithms
1	14	15	14	15	14
2	15	14	15	14	15
3	12	12	12	12	12
4	13	13	13	4	13
5	10	10	10	7	10
6	4	4	11	5	11
7	7	7	4	10	4
8	11	11	7	11	7
9	5	5	8	13	8
10	1	1	5	1	1
11	8	8	9	9	5
12	6	6	1	6	6
13	3	3	6	8	3
14	9	2	3	3	2
15	2	9	2	2	9

TABLE 5.2.4

RANKINGS OF CENSUS DIVISIONS FROM MOST EQUAL DISTRIBUTION OF INCOME TO LEAST EQUAL, BY MEASURE OF INEQUALITY AND DEFINITION OF FARM INCOME

(GROSS FARM CASH INCOME PLUS OFF-FARM LABOUR INCOME PLUS INCOME IN KIND)

Rank Position	Gini Coefficient	Relative Mean Deviation	Variance	Coefficient of Variation	Standard Deviation of Logarithms
1	14	15	14	15	14
2	15	14	15	14	15
3	12	12	12	4	12
4	10	10	13	12	13
5	13	13	10	7	10
6	4	4	11	5	11
7	11	11	4	10	4
8	7	5	7	11	7
9	5	1	8	13	1
10	1	7	5	1	5
11	8	8	9	9	8
12	6	6	1	6	6
13	3	3	6	8	3
14	9	2	3	3	2
15	2	9	2	2	9

TABLE 5.2.5

RANKINGS OF CENSUS DIVISIONS FROM MOST EQUAL DISTRIBUTION OF INCOME TO LEAST EQUAL, BY MEASURE OF INEQUALITY AND DEFINITION OF FARM INCOME (NET FARM CASH INCOME)

Rank Position	Gini Coefficient	Relative Mean Deviation	Variance	Coefficient of Variation	Standard Deviation of Logarithms
1	-	4	14[a]	8	-
2	-	1	15[a]	4	-
3	-	9[a]	9[a]	9[a]	-
4	-	7	11	1	-
5	-	5	12	5	-
6	-	3	8	7	-
7	-	8	10	3	-
8	-	2	13	6	-
9	-	6	4	2	-
10	-	10	7	10	-
11	-	13	5	13	-
12	-	11	1	11	-
13	-	12	6	15[a]	-
14	-	15[a]	3	12	-
15	-	14[a]	2	14[a]	-

TABLE 5.2.6

RANKINGS OF CENSUS DIVISIONS FROM MOST EQUAL DISTRIBUTION OF INCOME TO LEAST EQUAL, BY MEASURE OF INEQUALITY AND DEFINITION OF FARM INCOME.

(NET FARM CASH INCOME PLUS INCOME IN KIND)

Rank Position	Gini Coefficient	Relative Mean Deviation	Variance	Coefficient of Variation	Standard Deviation of Logarithms
1	4	4	14	4	4
2	1	1	15	5	1
3	5	7	9	1	5
4	7	5	11	7	7
5	3	8	12	6	3
6	8	3	10	3	2
7	2	6	13	11	8
8	6	10	4	8	6
9	-	2	7	2	-
10	-	13	8	10	-
11	-	11	5	13	-
12	-	12	1	12	-
13	-	15	6	9	-
14	-	9	3	14	-
15	-	14	2	15	-

TABLE 5.2.7

RANKINGS OF CENSUS DIVISIONS FROM MOST EQUAL DISTRIBUTION OF INCOME TO LEAST EQUAL, BY MEASURE OF INEQUALITY AND DEFINITION OF FARM INCOME

(NET FARM CASH INCOME PLUS OFF-FARM LABOUR INCOME)

Rank Position	Gini Coefficient	Relative Mean Deviation	Variance	Coefficient of Variation	Standard Deviation of Logarithms
1	14	14	14	14	14
2	15	15	15	11	15
3	11	11	11	4	11
4	12	12	9	15	12
5	4	4	12	1	13
6	1	1	10	5	4
7	13	13	13	7	1
8	8	8	4	8	8
9	10	7	7	6	10
10	7	10	8	3	7
11	5	5	5	10	3
12	3	6	1	13	6
13	6	3	6	12	5
14	2	2	3	2	2
15	9[b]	9	2	9	9[b]

TABLE 5.2.8.

RANKINGS OF CENSUS DIVISIONS FROM MOST EQUAL DISTRIBUTION OF INCOME TO LEAST EQUAL, BY MEASURE OF INEQUALITY AND DEFINITION OF FARM INCOME

(NET FARM CASH INCOME PLUS OFF-FARM LABOUR INCOME PLUS INCOME TO KIND)

Rank Position	Gini Coefficient	Relative Mean Deviation	Variance	Coefficient of Variation	Standard Deviation of Logarithms
1	14	14	14	14	14
2	15	15	15	11	15
3	11	11	11	4	11
4	12	12	9	15	12
5	4	4	12	5	4
6	13	1	10	1	13
7	1	10	13	7	10
8	10	13	4	6	1
9	8	8	7	8	8
10	7	7	8	10	7
11	5	5	5	3	5
12	6	6	1	12	6
13	3	3	6	9	3
14	2	2	3	13	2
15	9[b]	9	2	2	9[b]

NOTE: A blank denotes non-availability of measures due to negative income groups.
[a]Overall net losses. Inequality measured in terms of inequality of losses.
[b]Not available due to negative income groups.

The Gini Coefficient and Other Measures of Inequality

A comparison of the Gini coefficient[1] ranking of census divisions with the rankings obtained using each of the alternative measures of income inequality, for each particular definition of income, reveals that the measures of income inequality most closely approximating the Gini coefficient ranking are the relative mean deviation and the standard deviation of logarithms. Due to the nature of the measures, however, the Gini coefficient and the standard deviation of logarithms are simultaneously absent. As a result, it appears that the measure which should be substituted for the Gini coefficient in these cases is the relative mean deviation. Thus, whenever a complete Gini coefficient ranking is not available, the relative mean deviation ranking is substituted as a proxy for the purpose of the analysis.

This study indicates that substantial discrepancies exist between the rankings of the various measures of income inequality. This is particularily evident when the Gini coefficient rankings are compared to the variance and coefficient of variation rankings. One method of quantifying the degree of ranking discrepancy between any two alternative measures of income inequaltiy is given by the Spearman rank order coefficient. Denoting r_{i1} as the rank position of the

[1]The functional forms used in the computation of the various measures of income inequality, including the Gini coefficient, were presented in Chapter III. Due to the nature of the data the "group" functional forms of the measures were used.

i-th census division as determined by the first measure of income inequality, r_{i2} as the rank position of the i-th census division as determined by a second measure of income inequality, and n as the number of census divisions, the Spearman rank order coefficient is defined as:[1]

$$S = 6 \sum_{i=1}^{n} (r_{i1} - r_{i2})^2/n(n^2-1)$$

The discrepancy, as defined by the Spearman rank order coefficient, between the Gini coefficient ranking of census divisions and the ranking as determined by each of the other possible measures is presented in Table 5.3. The complete rankings of census divisions as determined by comparisons of Gini coefficients--or relative mean deviations, when appropriate--is presented in Table 5.4. These rankings are used for a comparative study of 1970 farm income distribution among Alberta census divisions.

The Results

The fifteen Alberta census divisions are divided, according to the rank order determined by the Gini coefficient, into three levels of income equality, each level consisting of five appropriately ranked census divisions. The highest level includes the five census divisions ranked most equal, the medium level includes the five mid-ranked census divisions, and the lowest level includes the five census divisions ranked least equal. The levels of equality are presented in diagrammatic form, with respect to each definition of income, in

[1]Helen M. Walker and Joseph Lev, Elementary Statistical Methods, rev.ed. (New York: Henry Holt and Co., 1958), pp.158-160.

TABLE 5.3

SPEARMAN RANK ORDER COEFFICIENTS

Definition of Farm Income	Gini Coefficient Versus: Relative Mean Deviation	Variance	Standard Deviation of Logarithms	Coefficient of Variation
G	.179	3.107	.179	2.161
G_L	.070	.464	.286	1.090
G_K	.179	3.107	.179	2.161
G_{LK}	.179	.375	.143	1.250

TABLE 5.4

RANKINGS OF CENSUS DIVISIONS FROM MOST EQUAL INCOME DISTRIBUTION TO LEAST EQUAL FOR THE PURPOSE OF COMPARATIVE ANALYSIS, BY DEFINITION OF FARM INCOME

Rank Position	G	G_L	G_K	G_{LK}	N	N_L	N_K	N_{LK}
1	4	14	4	14	4	14	4	14
2	15	15	15	15	1	15	1	15
3	12	12	12	12	9[a]	11	5	11
4	7	13	7	10	7	12	7	12
5	10	10	10	13	5	4	3	4
6	5	4	5	4	3	1	8	13
7	14	7	14	11	8	13	6	1
8	13	11	13	7	2	8	10	10
9	1	5	1	5	6	10	2	8
10	8	1	8	1	10	7	13	7
11	11	8	11	8	13	5	11	5
12	6	6	6	6	12	3	12	6
13	3	3	3	3	12	6	15	3
14	2	9	2	9	15[a]	2	9	2
15	9	2	9	2	14[a]	9	14	9

[a]Overall net losses. Inequality measured in terms of inequality of losses.

in Figures 5.2 to 5.7. Similarily, the fifteen census divisions are divided into three levels according to a ranking of census divisions by average income level. The highest level includes the five census divisions with the highest average incomes, the medium level consists of the mid-ranked census divisions, and the lowest level includes the five census divisions with the lowest average incomes. The fifteen Alberta census divisions are ranked according to average income levels from high to low for each definition of farm income in Table 5.5. The average income levels are presented in diagrammatic form, with respect to each definition of income, in Figures 5.2 to 5.7.

Gross Farm Cash Income

Taking gross farm cash income as the measure of farm income, it appears that the census divisions tending to have the most equal distributions of farm income in 1970 are in the northern and middle eastern regions of Alberta, while the census divisions with the least equal distribution of farm income are in the southern and western regions. At the same time, average incomes appear lower in the north than in the south. A study of Figure 5.2 reveals a substantial overlap between those census divisions with relatively equal distributions of farm income and those with low average incomes, and between those census divisions with less equal farm income distributions and those with higher average incomes.

Three hypothetical explanations are presented--but not tested--to explain the variation of average income levels among census divisions and the variation among census divisions

FIGURE 5.2

AVERAGE LEVELS OF FARM INCOME AND LEVELS OF EQUALITY OF THE DISTRIBUTION OF FARM INCOME (GROSS FARM CASH INCOME--GROSS FARM CASH INCOME PLUS INCOME IN KIND)

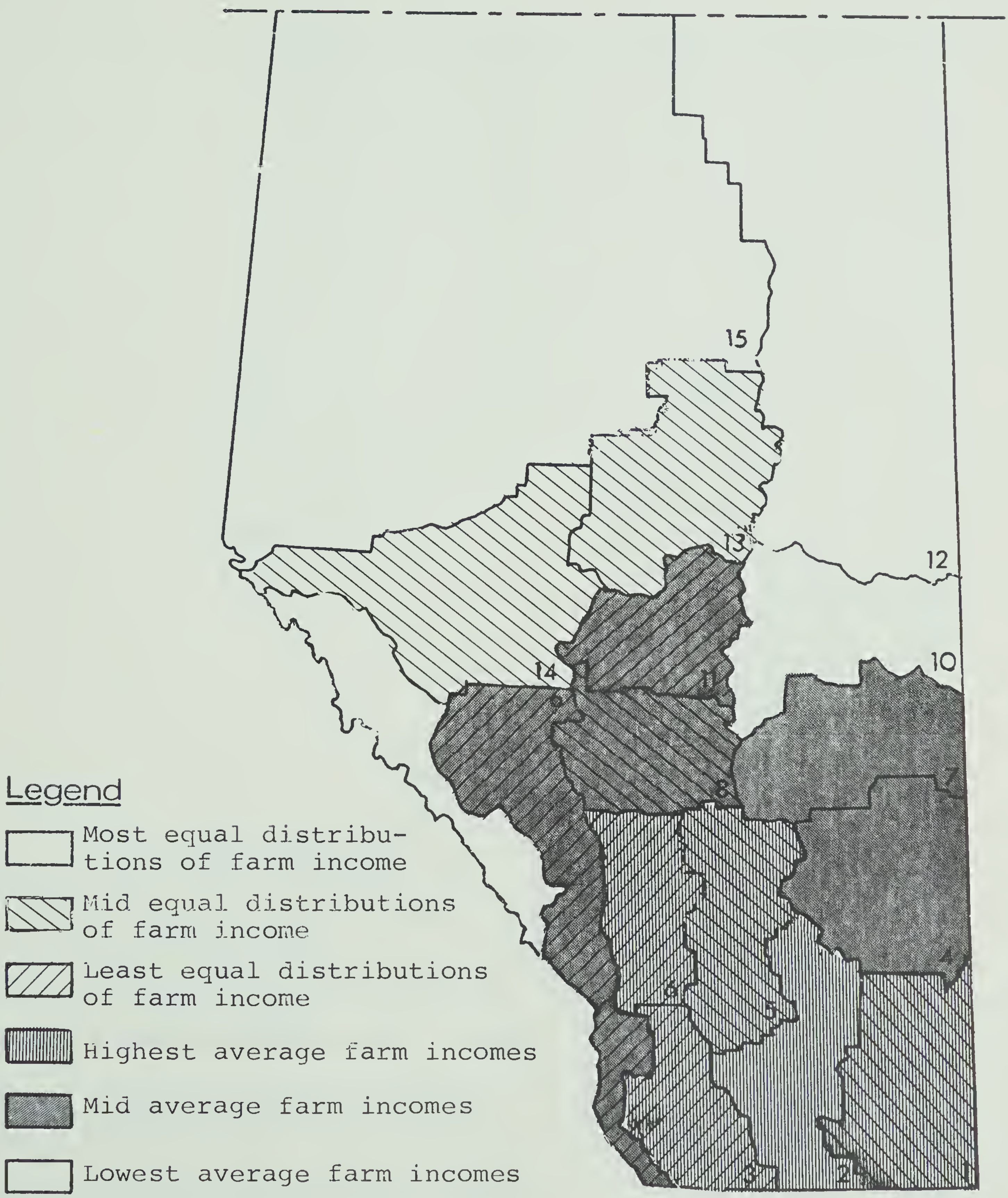


FIGURE 5.3

AVERAGE LEVELS OF FARM INCOME AND LEVELS OF EQUALITY OF THE DISTRIBUTION OF FARM INCOME (GROSS FARM CASH INCOME PLUS OFF-FARM LABOUR INCOME--GROSS FARM CASH INCOME PLUS OFF-FARM LABOUR INCOME PLUS INCOME IN KIND)

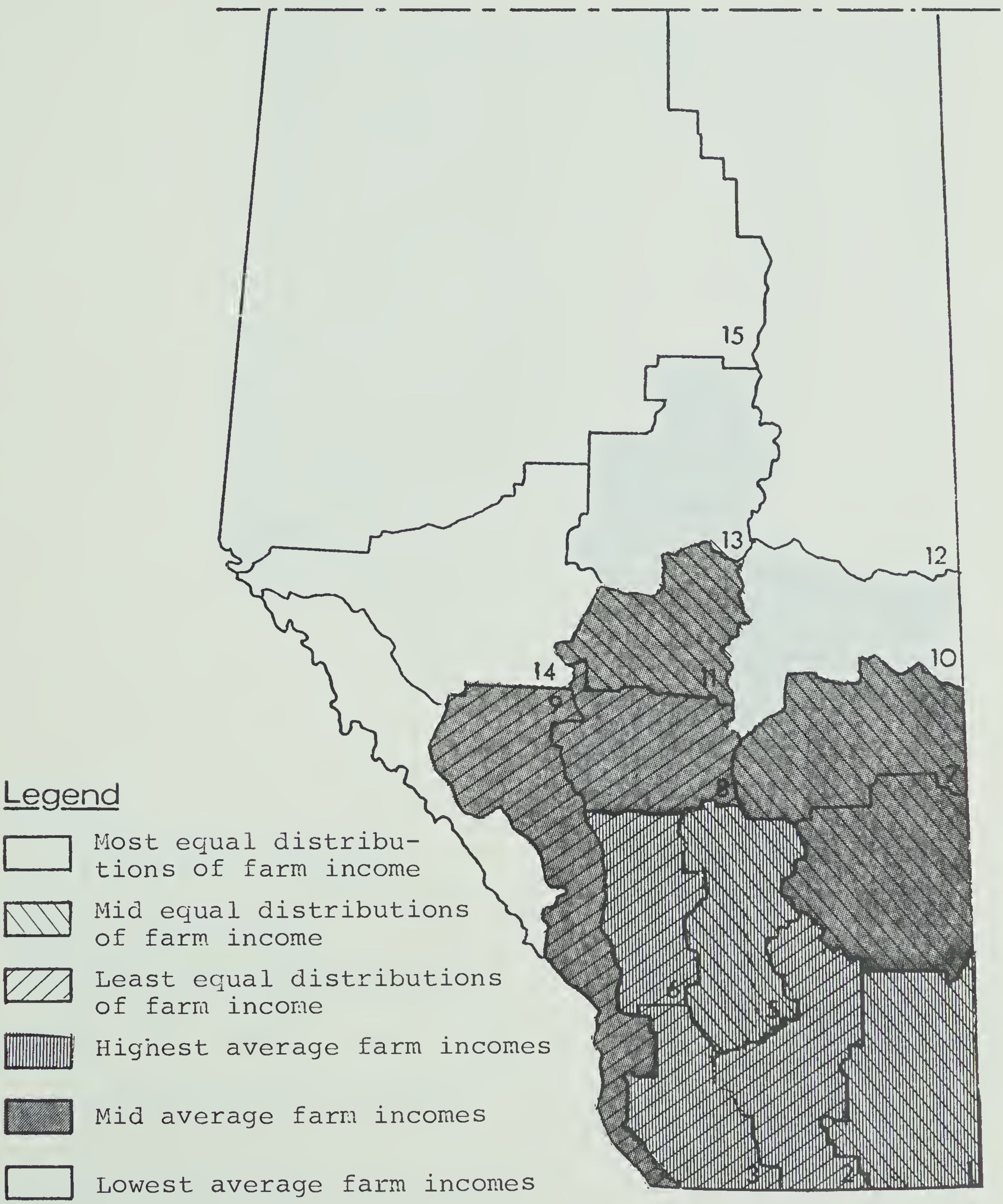


FIGURE 5.4

AVERAGE LEVELS OF FARM INCOME AND LEVELS OF EQUALITY OF THE DISTRIBUTION OF FARM INCOME (NET FARM CASH INCOME)

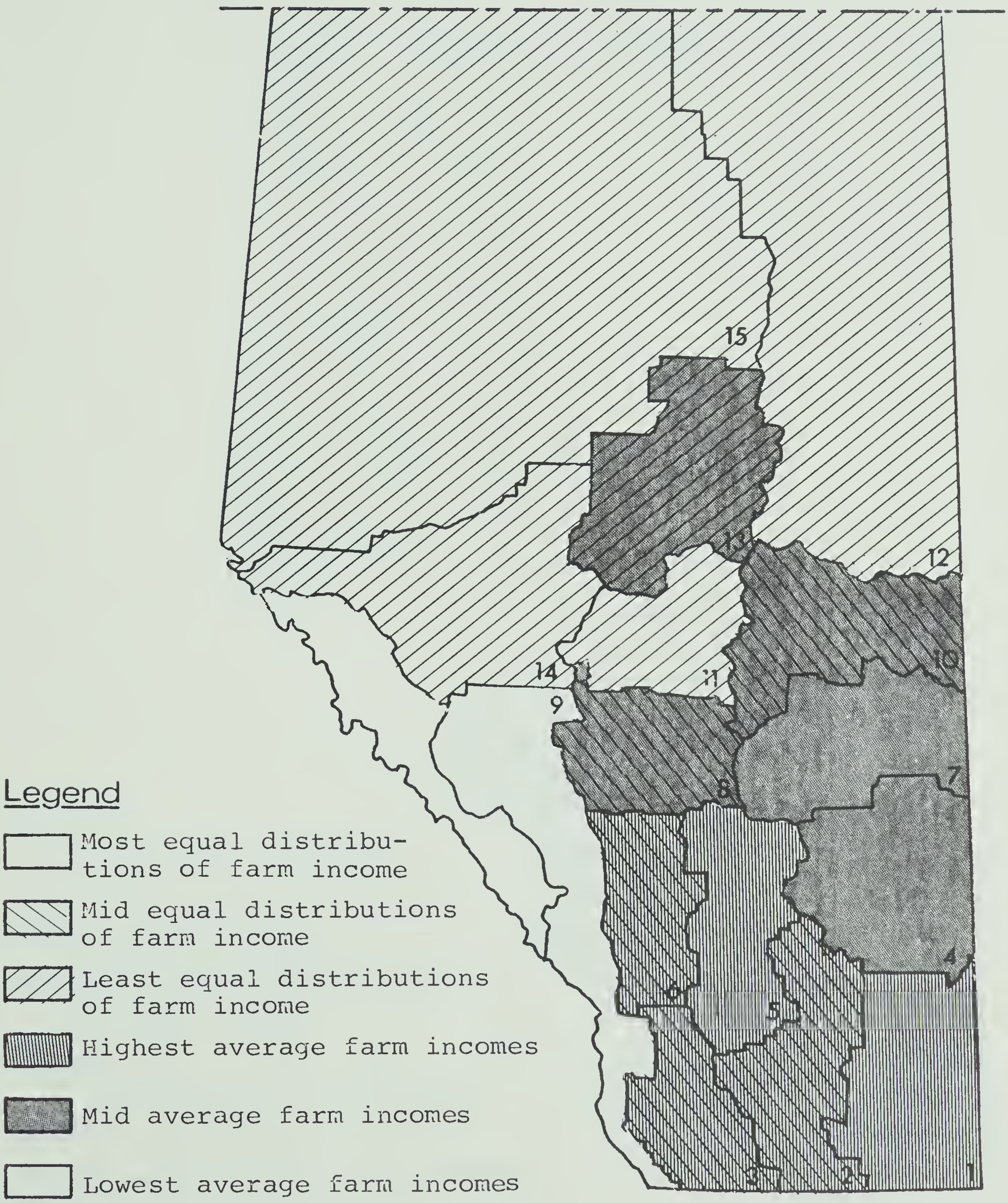


FIGURE 5.5

AVERAGE LEVELS OF FARM INCOME AND LEVELS OF EQUALITY OF THE DISTRIBUTION OF FARM INCOME (NET FARM CASH INCOME PLUS INCOME IN KIND)

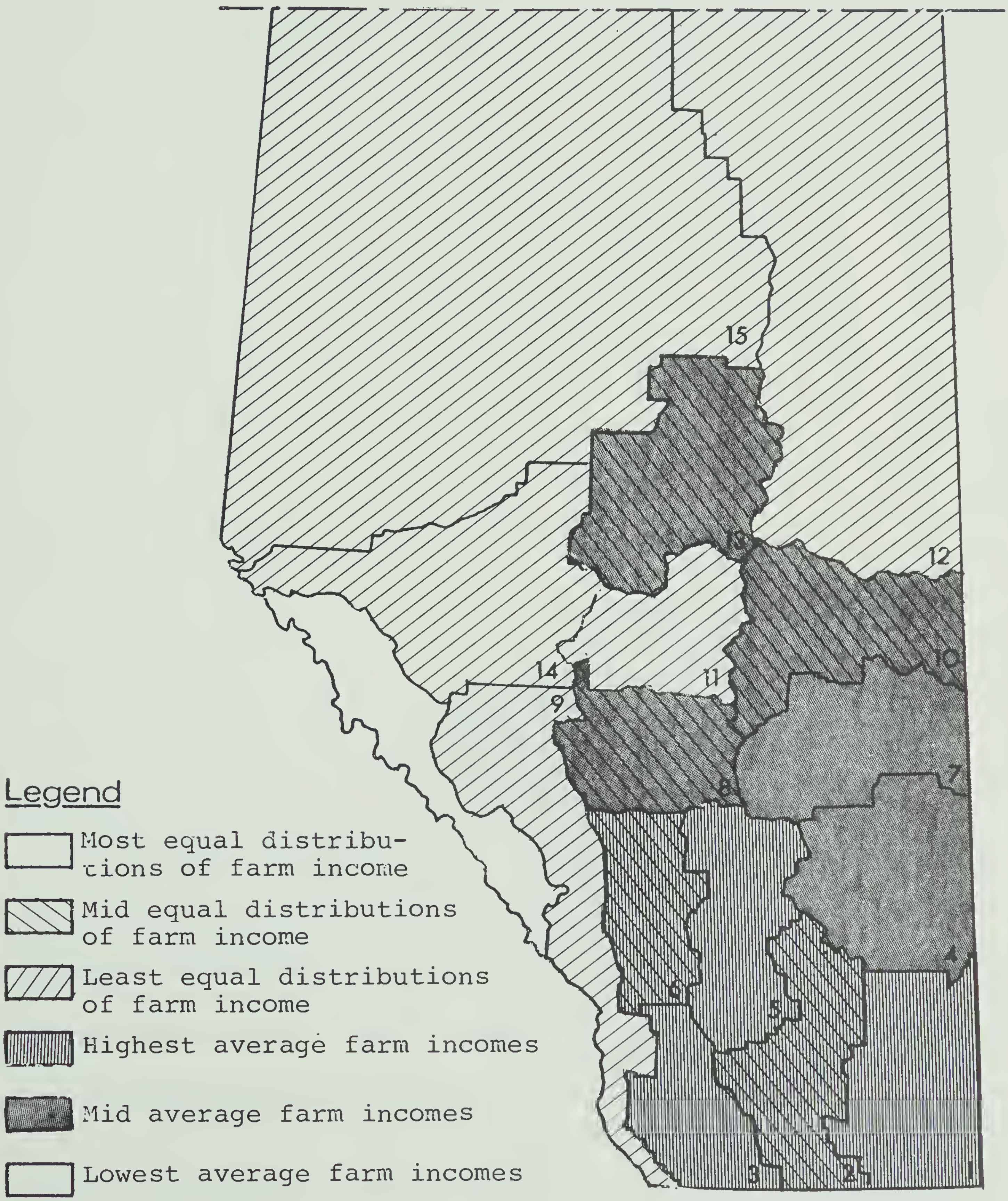


FIGURE 5.6

AVERAGE LEVELS OF FARM INCOME AND LEVELS OF EQUALITY OF THE DISTRIBUTION OF FARM INCOME (NET FARM CASH INCOME PLUS OFF-FARM LABOUR INCOME)

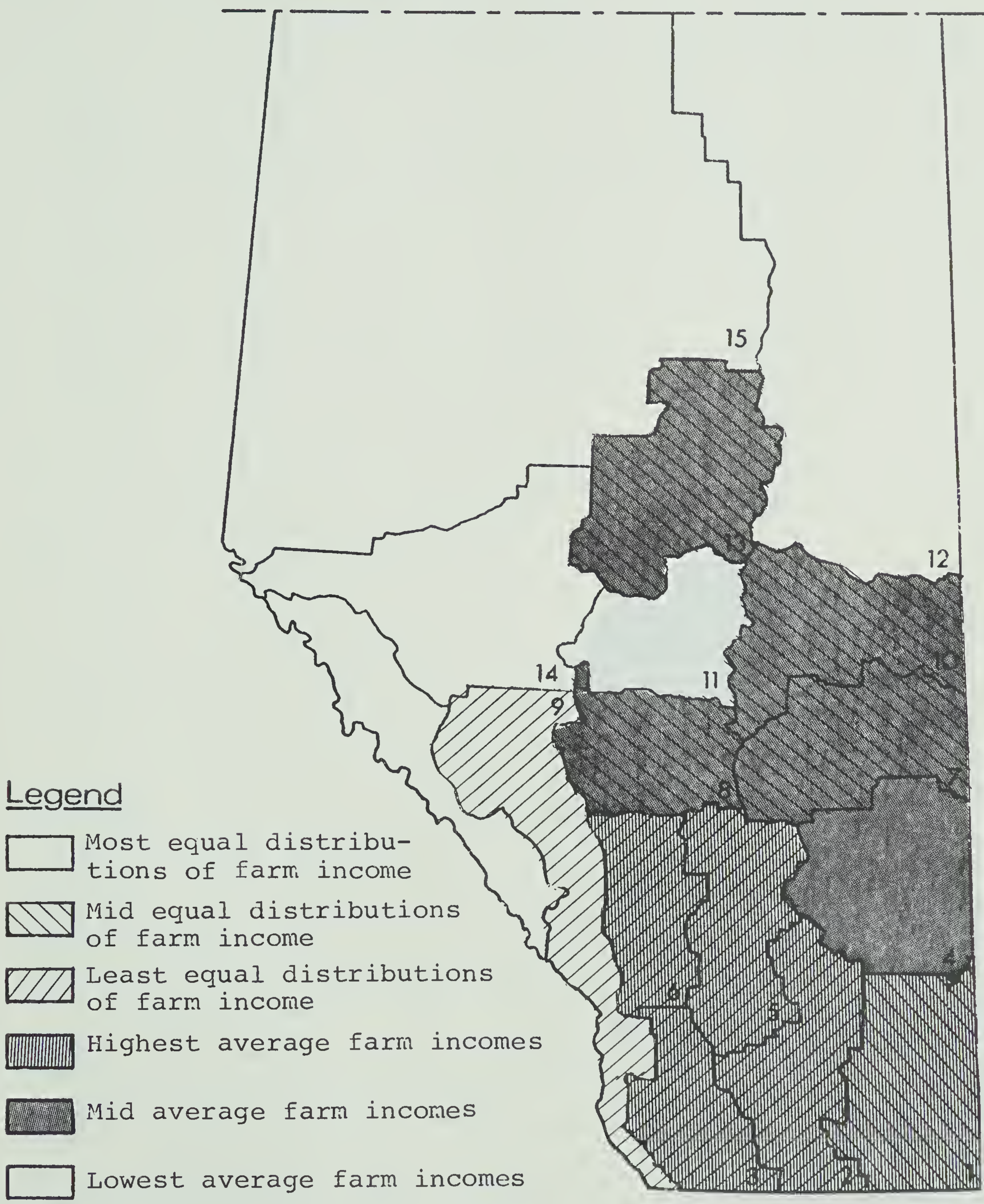


FIGURE 5.7

AVERAGE LEVELS OF FARM INCOME AND LEVELS OF EQUALITY OF THE DISTRIBUTION OF FARM INCOME (NET FARM CASH INCOME PLUS OFF-FARM LABOUR INCOME PLUS INCOME IN KIND)

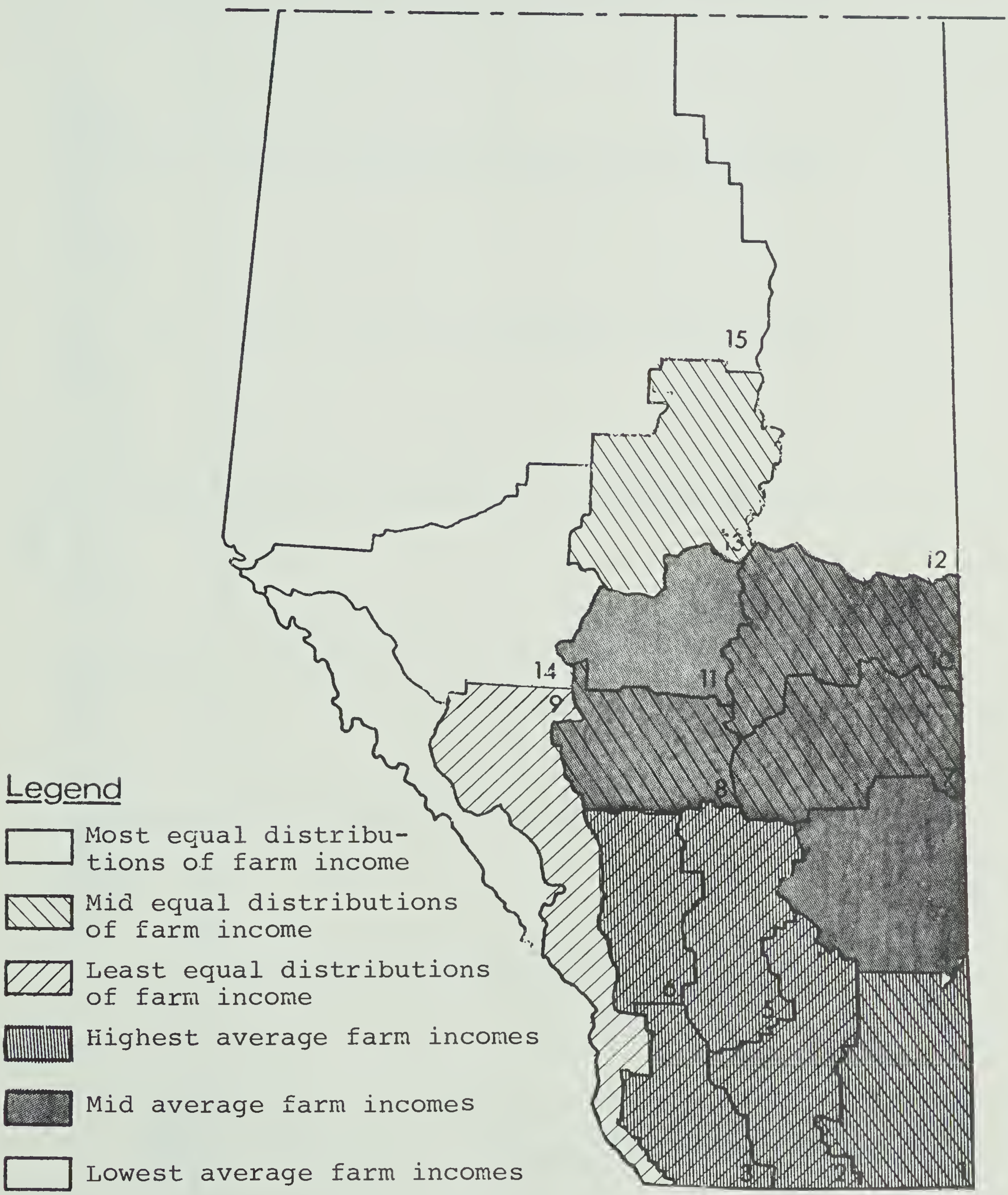


TABLE 5.5

RANKINGS OF CENSUS DIVISIONS BY AVERAGE INCOME LEVELS
FROM HIGH TO LOW AND BY DEFINITION OF FARM INCOME

Rank Position	G	G_L	G_K	G_{LK}	N	N_L	N_K	N_{LK}
1	2	2	2	2	2	2	2	2
2	3	3	3	3	3	3	3	3
3	6	6	6	6	1	1	1	1
4	5	5	5	5	6	6	6	6
5	1	1	1	1	5	5	5	5
6	9	9	9	9	4	4	4	4
7	4	4	4	4	7	7	7	7
8	7	7	7	7	8	8	8	8
9	8	8	8	8	10	10	10	10
10	11	11	11	11	13	13	13	11
11	10	10	10	10	11	11	11	13
12	13	13	13	13	12	14	12	15
13	15	15	15	15	15	15	9	12
14	12	12	12	12	14	12	15	14
15	14	14	14	14	9	9	14	9

of the level of income inequality. In the first place, the variation in natural conditions among census divisions gives rise to production advantages of some census divisions relative to others. Natural advantages of production may include factors such as soil quality, geographical and locational characteristics and climatic conditions. Thus, if two areas are characterized by essentially the same "type" of farm operation, whether livestock, grain or mixed livestock and grain, natural advantages of production accruing to one of the areas will be reflected in overall higher average incomes. To the extent that natural conditions of production vary among census divisions, average income levels among census divisions will diverge. Similarily, homogeneity of the natural conditions of production within a census division will tend to favour an equalization of farm incomes, and hence a more equal distribution of farm income relative to less naturally homogeneous census divisions.

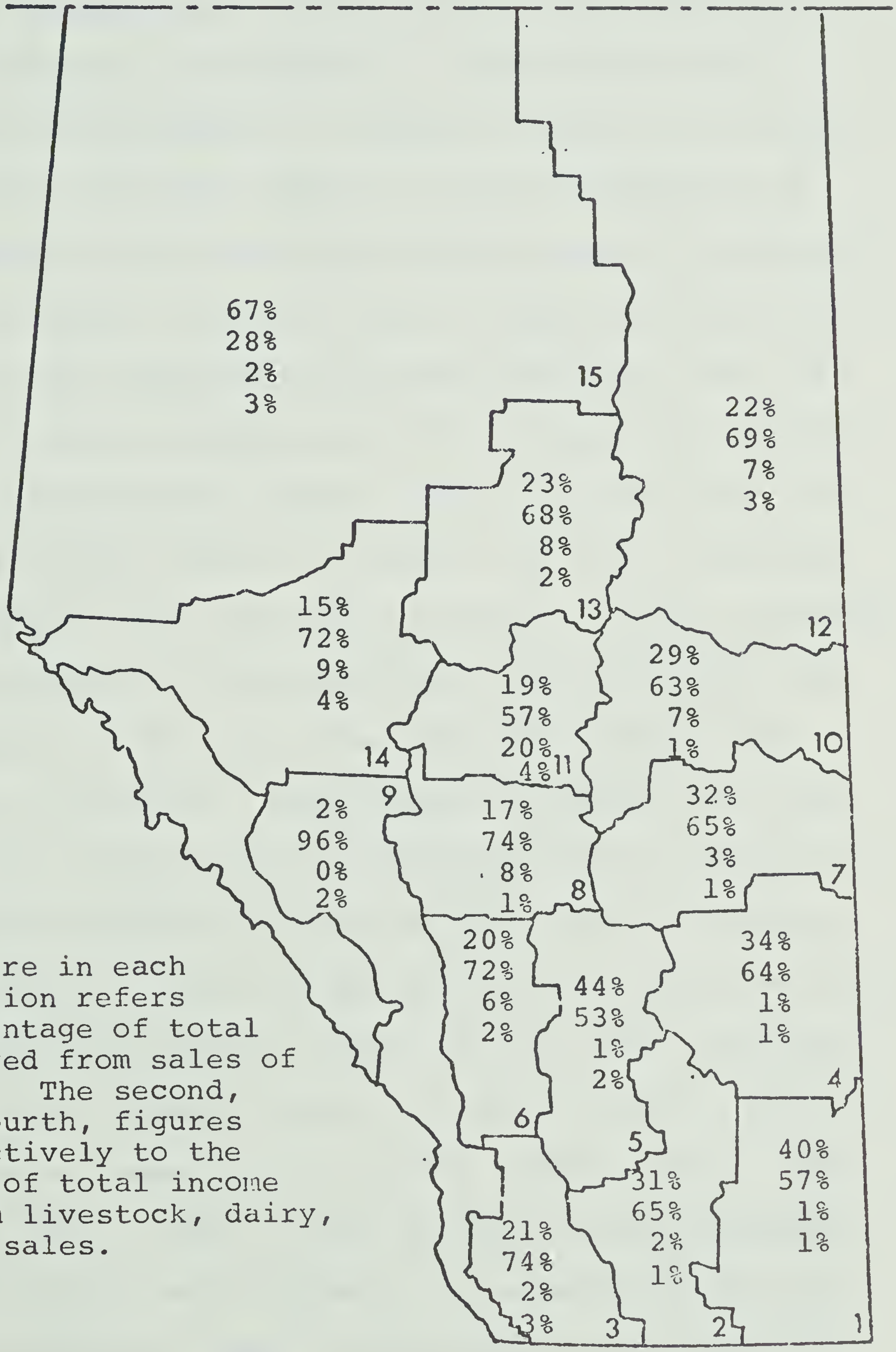
Secondly, the variation of the type of farm operation among census divisions gives rise to differences in average farm incomes among census divisions. One characteristic of the agricultural sector in 1970 was the low income situation of grain producers relative to livestock producers. This resulted from the restricted grain markets and low grain prices which applied to grain producers and the relatively more attractive livestock prices which applied to producers of livestock in that year. Thus, it is expected that census divisions characterized by livestock oriented farm operations

will reflect relatively higher average income levels than census divisions characterized by grain oriented farm operations. In fact, however, an examination of average gross farm cash incomes among Alberta census divisions does not appear to reflect this tendency. As shown in Figure 5.8, the northern census divisions which are characterized by relatively low average farm incomes--with the exception of census division 15--appear to emphasize livestock production as much as the higher income southern census divisions. As a result other factors must explain the income differentials among census divisions. Study of Table B.1 in Appendix B-- which presents the economic characteristics of census farms by economic class and census division--reveals that within each census division, higher income farm operators tend to increasingly emphasize the production of livestock and livestock products, particularily cattle production. The more homogeneous are the type of farm operations within a specific census division, the more equally will farm income tend to be distributed within that census division relative to others. Thus, it may be that the lack of homogeneity of the type of farm operation leads to a relatively unequal distribution of farm income in that census division. This lack of homogeneity is illustrated with respect to census division one, where according to Table B.1 of Appendix B livestock production accounted for between 26 percent of gross farm cash income in the $250-2,499 economic class to 75 percent in the $50,000+ group.

FIGURE 5.8

AGRICULTURAL PRODUCTION BY PRODUCT TYPE

BY CENSUS DIVISION



* The top figure in each census division refers to the percentage of total income derived from sales of grain crops. The second, third and fourth, figures refer respectively to the percentages of total income derived from livestock, dairy, and 'other' sales.

Finally, the variation of farm income levels is likely to be influenced by the relative nature and stage of development of the agriculture sector among census divisions. If there are significant economies of scale, there may be a tendency for the expansion of farm operations to the level where scale economies are achieved. This process could result in the transformation of smaller concerns into larger operations with consequent effects on the distribution of income. Whether or not advantage has been taken of economies of scale which exist is likely to be a complex process involving the type and organization of farm operations, the life cycle stage of farm operators, as well as the stage of development of the agriculture sector. Thus, it may be the case that in the northern region of Alberta, which has developed as an agricultural area relatively recently, either economies of scale at present are not significant, or sufficient time has not passed to allow for advantage to be taken of the existing scale economies. Examination of average farm size as well as cost-income ratios by economic class in Table B.1 indicates that economies of scale do exist in the northern census divisions, but that income and cost advantages accruing from farm expansion have not generally been taken advantage of. As a result, existing farms in northern Alberta tend to be smaller and of lesser gross and net income capacity than farms in the south. Thus, it may be that the pre-expansion stage of development which appears to characterize the northern census divisions leads to relatively low but equally

distributed gross farm incomes. At the same time, it may be that the southern census divisions are in a process of transition to a stage of development characterized by very large, efficient farm operations, a process which reflects relatively high but less equally distributed gross farm incomes.

It is beyond the scope of the present study to test these hypotheses. However, it is feasible that the interrelated impact of the tendencies hypothesized affects the differences observed in the 1970 distribution of gross farm income within Alberta. Testing and quantification of the impact of these factors on farm income distribution using, for example, time-series or cross-section regression analysis, may prove useful from a policy formation standpoint.

Income in Kind

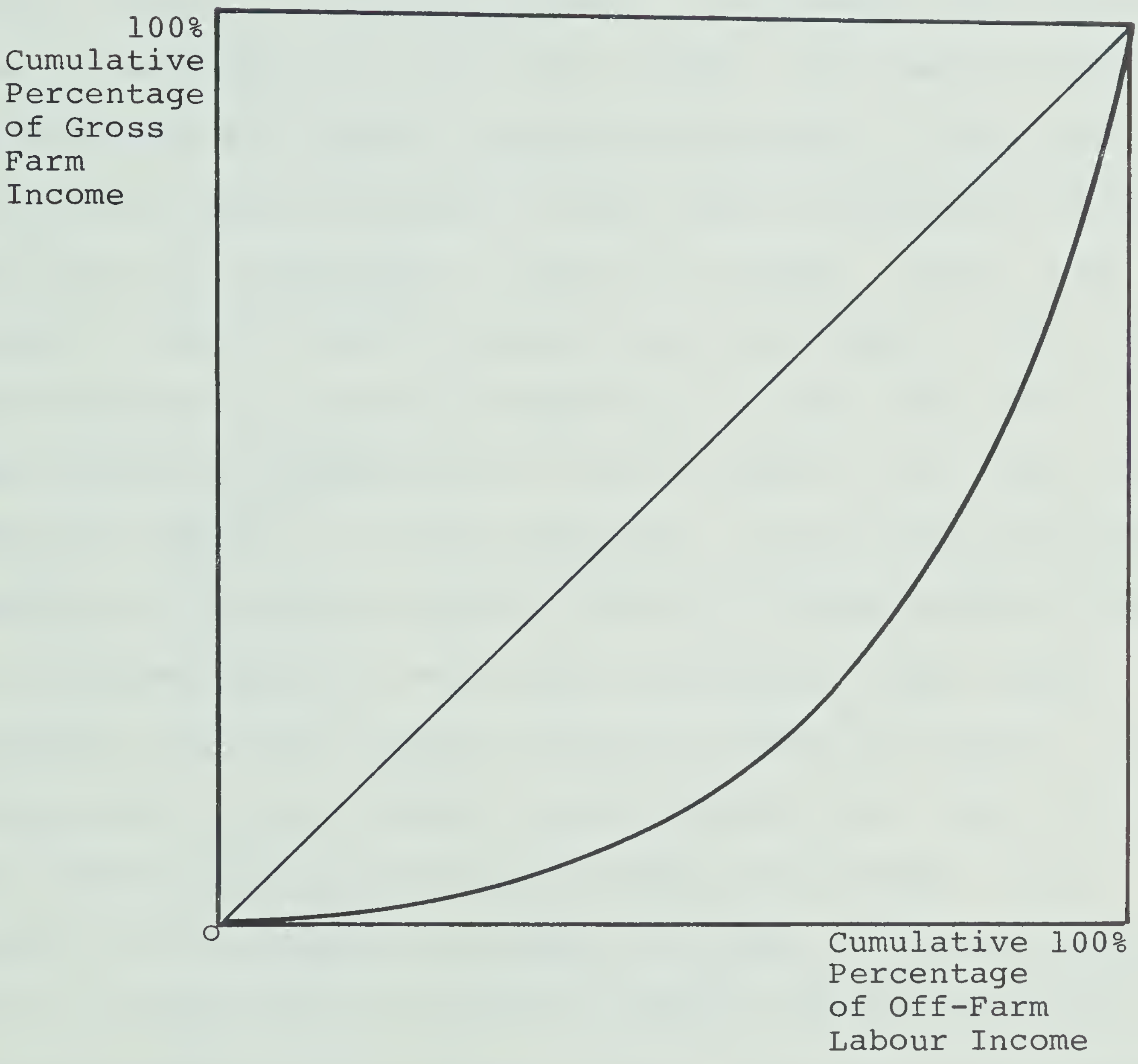
When income in kind is added to gross farm cash income and the distribution of this new measure of farm income--gross farm cash income plus income in kind--is computed using Gini coefficient techniques, the distributional ranking of census divisions is not altered. Neither does the average ranking of census divisions change. This is due to the nature of the distribution of income in kind among census divisions--13.355 percent of gross farm cash income is added to the gross farm cash income of each census division. As a result, average gross farm cash income plus income in kind is for every census division 13.355 percent greater than average gross farm cash income, and hence leads

to no change in the average farm income ranking of census divisions.

In general, it appears that the total impact on the Gini coefficient ranking of census divisions as a result of including a new component in farm income--whether positive or negative--can be divided into two separate impacts. In the first place, if there is a variation among census divisions of the relative size of the included component for each economic group vis-a-vis the base income accruing to each group, there will be a "distributional" impact on the Gini coefficient ranking of census divisions. One method of measuring this impact is by computing the Gini coefficient which corresponds to the Lorenz curve which describes the relationship between the cumulative percentage of base income earned, from lowest base income class to highest, and cumulative percentage of the component. An hypothetical relationship of this nature is illustrated in Figure 5.9. A larger Gini coefficient associated with this particular distributional comparison indicates that a proportionally larger share of the component accrues to those operators earning the lowest base incomes vis-a-vis their share of total base income. Thus, for example, if income in kind as a percentage of gross farm cash income is more heavily concentrated in the lower income groups in one census division than another, then it is possible that a shift in the Gini rankings of the two census divisions can occur. However, if income in kind as a percentage of gross farm cash income is equally concen-

FIGURE 5.9

AN HYPOTHETICAL LORENZ RELATIONSHIP
DESCRIBING OFF-FARM LABOUR INCOME
AS A FUNCTION OF GROSS FARM INCOME



trated in each income class for both census divisions then it is not possible to have a "distributional" impact on the Gini coefficient ranking of census divisions.

Secondly, if there is a variation among census divisions of the proportion the new component represents of the base income, there may be a "size" impact on the Gini coefficient ranking of census divisions. The greater the relative size of the component to the base income, the greater will be the change in the size of the Gini coefficient. Thus, variation among census divisions of the relative component sizes may lead to an alteration of the Gini ranking. Since, when income in kind is added to gross farm cash income, income in kind represents a constant proportion of gross farm cash income, there is consequently no "size" impact on the Gini coefficient ranking of census divisions. On the other hand, the tendency of the distributional effect of adding income in kind is to narrow the Gini coefficient discrepancy among census divisions, since for census divisions ranked less equal, income in kind is more heavily concentrated on the lower end of the income scale vis-a-vis gross farm cash incomes. This feature is illustrated in column 1 of Table 5.6 which presents the Gini coefficients derived by graphing cumulative percentage of gross farm cash income against the cumulative percentage of income in kind. Apparently the distributional tendencies are sufficiently small so as not to alter the Gini coefficient ranking of census divisions. Thus, the average income and Gini coefficient rankings of census divisions in

TABLE 5.6

GINI COEFFICIENTS DESCRIBING PARTICULAR LORENZ RELATIONSHIPS, BY CENSUS DIVISION

Census Division	Cumulative Percentage of Gross Farm Cash Income Versus Cumulative Percentage of Income in Kind	Cumulative Percentage of Gross Farm Cash Income Versus Cumulative Percentage of Off-Farm Labour Income	Cumulative Percentage of Gross Farm Cash Income Plus Off-Farm Labour Income Versus Cumulative Percentage of Income in Kind	Cumulative Percentage of Gross Farm Cash Income Versus Cumulative Percentage of Total Farm Expenses
1	.5497	.8254	.5019	.0796
2	.6472	.8490	.6109	.1244
3	.6228	.8331	.5775	.1244
4	.4804	.7244	.4447	.0655
5	.5236	.8037	.4885	.1039
6	.6150	.8699	.5550	.1270
7	.5071	.7699	.4586	.1332
8	.5902	.8325	.5070	.1274
9	.6729	.8633	.5945	.0106
10	.5226	.7704	.4335	.1503
11	.5977	.8055	.4603	.1131
12	.5027	.7301	.3663	.1696
13	.5495	.7492	.4327	.1401
14	.5484	.7325	.3259	.1935
15	.5010	.6764	.3360	.1599

Figure 5.2 apply to both gross farm cash income and gross farm cash income plus income in kind.

Off Farm Labour Income

The addition of off-farm labour income to gross farm cash income in each census division causes no change in the ranking of census divisions by average gross farm cash incomes. This is in spite of the fact that there are variations in the average level of off-farm labour income accruing to the fifteen census divisions, as shown in Table A.1 of Appendix A. With respect to changes in the distribution of income within census divisions, for each census division the addition of off-farm labour income to gross farm cash income causes income inequality to decline. The explanation for this is that in all census divisions, off-farm labour income is proportionally greater for the lower income levels of the income scale, thus providing an equalizing force which offsets to some degree the higher farm income shares earned by the higher level income groups.

The addition of off-farm labour income has the effect of altering the Gini coefficient income distribution ranking of the fifteen census divisions. Specifically, with reference to Table 5.4, census divisions four and seven which are in the highest level according to the Gini coefficient ranking of gross farm cash income, move to the mid-level according to the Gini coefficient ranking of gross farm cash income plus off-farm labour income. Meanwhile, census divisions thirteen and fourteen move from the mid-level to the highest level.

Further, census divisions eight and eleven trade their respective positions in the mid and lowest levels. These shifts are illustrated by comparing Figures 5.2 and 5.3. In general, it appears that when off-farm labour income is added to gross farm cash income, the northern census divisions tend to move into rank positions of relatively greater equality, thus emphasizing the distributional trend observed under the gross farm cash income definition of farm income.

The shifting of relative distributional positions among census divisions when off-farm labour income is included may be explained with reference to the "size" and "distributional" impacts. With regard to the size impact on the Gini coefficient ranking of census divisions in Alberta in 1970, off-farm labour income in the northern census divisions is apparently of greater significance to gross farm cash income than in the southern census divisions, as shown in column 2 of Table 5.7. This is understandable when it is considered that because of relatively lower gross and net farm incomes, there is a definite need to supplement farm earnings with other sources of income in the north. Thus, if presented with job opportunities, northern farm operators are more likely to take advantage of them. Since, as a result, in the northern regions of Alberta off-farm labour income is of greater significance to the base gross farm cash income, the tendency is to push the northern census divisions to positions of relatively greater equality--a tendency consistent with the observed change.

TABLE 5.7

PROPORTIONS OF SELECTED COMPONENT INCOMES TO SELECTED BASE INCOMES

BY CENSUS DIVISION

Census Division	Income in Kind / Gross Farm Cash Income	Off-farm Labour Income / Gross Farm Cash Income	Income in Kind / Gross Farm Cash Income plus off-Farm Labour Income	Total Farm Expenses / Gross Farm Cash Income
1	.13355	.04966	.12723	.70570
2	.13355	.03548	.12897	.70408
3	.13355	.04818	.12741	.70156
4	.13355	.04484	.12782	.73261
5	.13355	.03815	.12864	.78389
6	.13355	.06021	.12597	.76458
7	.13355	.05667	.12639	.73672
8	.13355	.09093	.12242	.76083
9	.13355	.09059	.12246	1.08818
10	.13355	.11115	.12019	.84199
11	.13355	.17510	.11365	.93990
12	.13355	.20336	.11098	.94573
13	.13355	.16051	.11508	.84748
14	.13355	.38980	.09609	1.02917
15	.13355	.29800	.10289	1.04126

With respect to the distributional impact of adding off-farm labour income to gross farm cash income, the tendency is for the southern census divisions to move to positions of greater equality relative to the north--a movement not consistent with the observed shifts as indicated in Table 5.4. As previously mentioned, off-farm labour income is concentrated in the lower income classes, in each census division, thus tending to offset gross farm cash income which is concentrated at the opposite end of the income scale. This tendency is more pronounced in the southern area of the province than in the north as shown in column 2 of Table 5.6, which presents the Gini coefficients derived when cumulative percentages of gross farm cash income are related to the cumulative percentages of off-farm labour income. The larger Gini coefficients associated with this particular distributional comparison in the southern census divisions indicate that in the north proportionally less off-farm labour income vis-a-vis gross farm cash income accrues to those operators earning the smallest gross incomes. The implication is that the equalizing force provided by adding off-farm labour income is greater in the southern census divisions than the north. As a result, it appears from the observed shifts in Table 5.4 that the size tendencies of adding off-farm labour income to gross farm cash income dominate the distributional tendencies.

Finally, the distributional effect of adding income

in kind to gross farm cash income plus off-farm labour income is once again to cause the southern census divisions to be pushed into positions of relative equality vis-a-vis the northern census divisions. This feature is shown in column 3 of Table 5.6 which presents the Gini coefficients derived by relating the cumulative percentage of gross farm cash income plus off-farm labour income to the cumulative percentage of income in kind. As before, the larger Gini coefficients associated with this particular distributional relationship imply a larger equalizing force in the southern census divisions. At the same time, since income in kind is added to the base gross farm cash income plus off-farm labour income, size tendencies on the Gini coefficients associated with gross farm cash income plus off-farm labour income plus income in kind, may cause shifts in the Gini coefficient ranking of census divisions. Since income in kind as a percentage of gross farm cash income plus off-farm labour income is greater in the south than the north, the tendency is to push the southern census divisions into positions of greater equality relative to the northern census divisions. Apparently, however, the combined tendencies are not sufficient to alter the Gini coefficient ranking beyond some minor shifts within the mid-level distributional range as shown in Table 5.4. Nor is the addition of income in kind sufficient to alter average rankings as shown in Table 5.5. As a result, the distributional and average rankings presented in Figure 5.3 are identical for gross farm cash income plus off-farm labour

income, and gross farm cash income plus off-farm labour income plus income in kind.

Expenses and Net Farm Income Estimates

When total farm expenses are subtracted from gross farm cash income, there is some shifting of average rankings of census divisions, as shown in Table 5.5. This is explained by variations in overall cost-income ratios among the census divisions. Specifically, cost-income ratios appear to be higher in the northern census divisions than in the south, as shown in Table B.1 of Appendix B. This causes a shift in the average ranking when expenses are subtracted, such that the northern census divisions are moved into lower net farm cash income positions vis-a-vis the southern census divisions.

With respect to the changes in the distribution of income within census divisions it appears from comparison of the relative mean deviations for gross farm cash income and net farm cash income for each census division, that by subtracting expenses, inequality in each census division is increased. This is shown in Table 5.1. The explanation for this feature is that in all census divisions, total farm expenses relative to gross farm cash incomes are higher in the lower income classes. This is shown by study of column 4 of Table 5.6 which presents the Gini coefficients which are derived from the Lorenz relationships between cumulative percentage of gross farm cash income and cumulative percentage of total farm expenses. In each case these Gini coef-

ficients indicate that proportionately higher costs vis-a-vis gross farm cash incomes are experienced among low farm income operators. Further, the tendency for adverse cost-income ratios to affect low income classes appears to be more pronounced in the northern regions of the province as witnessed by the larger values of the Gini coefficients associated with this particular distribution among the northern census divisions.

The subtraction of expenses from gross farm cash income has the effect of largely reversing the distributional ranking associated with the gross farm cash income definition of income as shown in Table 5.4. Thus, according to the distributional ranking of census divisions by net farm cash income, the northern census divisions have not only the lowest overall average net farm cash incomes but also the most unequal distributions of net farm cash income. This is shown with reference to Tables 5.4 and 5.5 and is illustrated in diagrammatic form in Figure 5.4.

The reversal of the distributional ranking from that observed under the gross farm cash income definition of farm income is explained with reference to size and distributional impacts of subtracting total farm expenses from gross farm cash income. Firstly, since expenses in the northern census divisions tend to be a greater proportion of gross farm income than in the south as shown in column 4 of Table 5.7, and since the distribution of expenses within each census division is such as to widen income inequities among economic

classes, the relatively greater size impact in the north of subtracting expenses, leads to relatively larger increases in inequality in the northern census divisions. As a result, the size impact on the distributional ranking of census divisions tends to force the northern census divisions into relatively less equal positions.

Secondly, since the disproportional concentration of total farm expenses relative to gross farm cash income in the north is more pronounced than in the south of the province, the tendency is to force the northern census divisions into positions of relative inequality vis-a-vis the south. Thus, the relatively greater increases in inequality which result from the larger distributional impacts of subtracting expenses in the northern census divisions, cause the size impacts to be supplemented. This forces the northern census divisions into relatively more unequal rank positions. These forces are consistent with the observed changes in the distributional ranking of census divisions.

Finally, when off-farm labour income, income in kind, and off-farm labour income plus income in kind, are each added to net farm cash income, the distributional ranking trends previously observed when gross farm income definitions were used, begin to appear once again. Apparently the size impacts of adding these additional components of farm income are sufficient to approximately restore the original distributional ranking trend. These shifts are observed with reference to Table 5.4 and Figures 5.4 to 5.7.

General Conclusions

It appears from an examination of the level and distribution of 1970 gross farm cash income in Alberta that the northern and middle eastern census divisions of Alberta are characterized by low but relatively equally distributed farm incomes vis-a-vis the southern and middle western census divisions. When off-farm labour income is included as a component of gross farm income the north-south regional trend becomes more pronounced. This is explained by the nature of the distribution of off-farm labour income within and among census divisions. However, when total farm expenses are subtracted from gross farm cash incomes for the census divisions, the distributional ranking largely reverses. As a result, the northern census divisions of Alberta in 1970 appear to have had the lowest and most unequally distributed net farm cash incomes in the province. This is explained by the nature of the distribution of total farm expenses within and among census divisions.

To explain the technical reasons for the observed shifts which occur when the definitions of farm income are changed is not to explain the underlying economic factors affecting these shifts. The latter is beyond the scope of this study. However, in order to provide guidelines for further detailed study in this area, certain hypotheses based upon an examination of the economic characteristics of census farms as presented in Tables B.1 and B.2 of the Appendix, are presented for consideration.

It is of interest to note that while off-farm labour income in every census division is disproportionately concentrated in the lower economic classes vis-a-vis gross farm cash income, this trend appears to be more pronounced in the more prosperous south. Similarily, while farm expenses in every census division are disproportionately concentrated in the lower income classes vis-a-vis gross farm cash income, this trend is more pronounced in the northern census divisions. Both observations may be consistent within the framework of an agricultural development income distribution hypothesis.

Within this framework, it is expected that the semi-frontier agricultural economy of northern Alberta is characterized by small, relatively inefficient farm operations while the earlier settled and more established southern area of the province is characterized by larger, more efficient operations. It is further expected that in the north, substantial economies exist in the form of reduced costs--possibly from the adoption of new technologies and techniques, specialization, land improvements, and farm size expansion. In contrast, it is anticipated that economies of much lesser significance and characterized less by cost advantages are available to operators in the southern region, where the important economies may have been exploited in an earlier period and an earlier stage of development. As a result, income distributions are more equal in the north when defined in terms of gross farm cash income but less equal in terms of net farm cash income. Consistent with this view are the

cost-income ratio and farm size data presented in Tables B.1 and B.2 of Appendix B. These data indicate that farm operations tend to be smaller and relatively inefficient in the northern region of Alberta with substantial economies of scale in the intial stages of expansion.[1]

Considering off-farm labour income within a developmental framework, it is not surprising that this component of total farm income is, on average, higher in the northern census divisions of Alberta than in the south. This is explained by the necessity to supplement low farm incomes derived from small and relatively inefficient farm operations in the north, with income from other sources. At the same time, it may be the case that off-farm job vacancies as well as the ability to take advantage of off-farm job opportunities tend to be greater in the north. It is also expected that farm operators in the more established southern region of the province have greater financial assets to turn to in the face of economic adversity and, therefore, are less required to work off the farm than are their northern counterparts. As a result, it is to be expected that off-farm labour income is distributed more equally in the northern census divisions than the south, since more often operators in the north are required to supplement farm earnings with off-farm

[1]It should be noted that economies of scale may not provide the entire explanation. As a result, expansion of farm size may be accompanied by economies of specialization, new technologies etc. The data presented in Tables B.1 and B.2 hide such explanatory variables.

labour income. Although incomplete, the data presented appears to be consistent with this view.

It is beyond the scope of this study to identify the economic factors which contribute to farm income disparities in Alberta. Some of the factors suggested appear however, to be consistent with the observed distribution of Alberta farm income in 1970. It is suggested that further study to identify and quantify the factors contributing to the nature of farm income distribution would prove valuable from the point of view of policy formation. Identification of these factors would aid the development of sound agricultural policy.

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

In Chapter I it was stated that the purpose of this study was to measure, within the context of a welfare economics approach to agricultural policy development, the level and, in particular, the distribution of 1970 farm income, within and among the Alberta census divisions. As a result, an attempt was made to apply welfare economic principles to the measurement of income inequality. The statistical device which was chosen for the purpose of measurement and comparative analysis, the Gini coefficient, was thus chosen according to welfare economic considerations.

This chapter presents the conclusions of this study with respect to (1) average levels of farm income in Alberta and (2) levels of inequality within the census divisions of Alberta. A number of recommendations are also presented.

Conclusions

Inequality Among Census Divisions: Average Incomes

This study shows that regardless of income definition, average farm incomes in the northern region of Alberta in 1970 were substantially lower than average farm incomes in

the south. With reference to gross farm cash income, census divisions ten through fifteen had the lowest levels of income per farm. The area covered by these census divisions is approximately the northern two-thirds of the province. Within this northern region, census divisions ten and eleven in the south-eastern portion had the highest levels of gross farm cash income per farm. Average gross farm cash income levels within the northern area varied from $9,290 in census division eleven to $4,454 in census division fourteen.[1] Moreover, a substantial increase in average incomes occurred immediately south of the northern region. Thus, the average level of gross farm cash income in census division eight was 33 percent greater than in census division eleven, even though in terms of gross farm cash income these census divisions were ranked adjacent to each other. As a result, there is a wide income gap between the northern region and the remaining part of the province.

The southern region, including census divisions one, two, three, five and six, showed relatively higher average levels of gross farm cash income. Thus, the average level of gross farm cash income in census division one--which had the lowest level of average gross farm cash income in the southern region--was 88 percent greater than the average level of gross farm cash income in census division eleven, which had the highest level of gross farm cash income per farm in the

[1]All average income figures in this chapter are presented in Table A.2 of Appendix A.

northern region. Further, average gross farm cash income in census division two was more than six times the average gross farm cash income in census division fourteen. With respect to the census divisions in the southern region of Alberta, average levels of gross farm cash income ranged from $17,442 in census division one to $27,089 in census division two.

The ranking of census divisions by average gross farm cash income did not change when each of income in kind and off-farm labour income was added to this measure of farm income. With respect to the addition of income in kind, there was no relative change among census divisions of average farm income levels due to the nature of the distribution of income in kind. When off-farm labour income was added, however, there were relative changes among census divisions of average income levels. Specifically, the disparities between northern census divisions and southern census divisions were reduced, since average off-farm labour incomes were greater in the northern census divisions, both absolutely and relative to gross farm cash incomes. Finally, the ranking of census divisions by average gross farm income did not change when both income in kind and off-farm labour income taken together was added to gross farm cash income. Thus, the same ranking of census divisions applied for each of the definitions of gross farm income.

The average income rankings of census divisions which emerged when total farm expenses were subtracted from each of the definitions of gross farm income were similar to the

average income ranking of census divisions which was observed for all of the definitions of gross farm income. With reference to net farm cash income, the northern census divisions continued to show relatively lower incomes than those in the south. In addition, census division nine also joined the low average farm income group of census divisions. This was due to the high cost-income structure in census division nine. In fact, the lowest recorded average net farm cash income level in 1970 was in census division nine. Thus, the lowest average net income census divisions were census divisions nine through fifteen. Net farm cash incomes per farm in this low income group of census divisions varied between \$-1,399 in census division nine and \$1,359 in census division ten. In terms of net farm cash income there was once again a substantial gap in average farm incomes between the northern and southern regions of the province. Indeed, average net farm cash income in census division eight--which, in terms of net farm cash income, was ranked above census division ten--was over two times the average net farm cash income of census division ten.

The pattern of average net farm cash income levels among the southern census divisions was similar to that for average gross farm income levels. Census divisions one, two, three, five and six, showed relatively higher average net farm incomes. Average net farm cash incomes in these census divisions ranged between \$4,104 in census division five to \$8,016 in census division two.

The general impact of subtracting expenses from gross incomes was to widen income disparities between census divisions in the northern and the southern regions of the province. This was due to the relatively higher cost-income positions of farm operators in the north vis-a-vis their southern counterparts. As a result, the extent of income disparity among the census divisions on a north-south provincial axis was magnified when examined in terms of net farm incomes.

Inequality Within Census Divisions: Gini Coefficients

This study indicates that a substantial degree of inequality in farm income distribution existed in 1970 within each of the Alberta census divisions and that this degree of inequality varied among the census divisions. It was also discovered that the degree of inequality within each census division and relative to the other census divisions varied with the definition of farm income. This feature arose because of the nature of the distribution of the various components which were alternately included in the definition of total farm income.

With reference to the gross farm cash income definition of farm income, incomes tended to be more equally distributed within each of the northern and eastern census divisions of Alberta. The most equal distribution of income appeared to be in census division four, where the Gini coefficient was estimated as 0.4804, while the most unequal distribution of income appeared to be in census division

nine, where the Gini coefficient was estimated as 0.6729.[1] To provide an illustration by which to compare these results, it is noted that in census division nine the lowest income 65.57 percent of all farm operators earned only 13.39 percent of total gross farm income, while in census division four the lowest 66.49 percent of all operators earned 30.88 percent of total gross farm cash income. Thus, although inequality in the distribution of farm income within census division four was less pronounced than inequality in census division nine, the farm income distribution of census division four in 1970 may still have been cause for concern.

When income in kind was included in gross farm income estimates, no change occurred in the ranking of census divisions by level of inequality as determined by the Gini coefficient. There was, however, a reduction in the overall level of inequality of the distribution of farm income for each of the census divisions and a tendency for relative Gini coefficient differentials among the census divisions to decline. This was a result of the nature of the distribution of income in kind within and among census divisions. Thus, when the relevant estimate of farm income was considered to be gross farm cash income plus income in kind, inequality as measured by Gini coefficients appeared less pronounced within each of the census divisions and between each of the census divisions i.e., relative to each other. The most equal distribution of gross farm cash income plus income in kind

[1]All Gini coefficients in this chapter are presented in Table 5.1 in Chapter V.

again appeared within census division four, where the Gini coefficient was estimated as 0.4239; while the least equal distribution appeared in census division nine, where the Gini coefficient estimated was 0.5936.

The inclusion of off-farm labour income in the estimate of gross farm income caused some change in the ranking of census divisions by the level of inequality of farm income distribution, as determined by Gini coefficients. The addition of this component of income caused the level of inequality within each of the census divisions to decline. At the same time, the distribution of farm incomes within the northern census divisions became more equal vis-a-vis the distribution of farm incomes within the southern census divisions. Both of these features were explained with respect to the nature of the distribution of off-farm labour income within and among the census divisions. Thus, when the relevant estimate of farm income was considered to be gross farm cash income plus off-farm labour income, the degree of inequality within each census division declined while the degree of inequality of the distribution of farm income declined relatively more in the northern census divisions. Thus, the most equal distribution of gross farm cash income plus off-farm labour income appeared to be in census division fourteen where the Gini coefficient was calculated to be 0.3259, while the most unequal distribution was in census division two where the Gini coefficient was reported to be 0.6109. It might be noted that census divisions fourteen and two had at the same time, respectively, the lowest and highest average gross

farm incomes as defined inclusive of off-farm labour income. In fact, relatively high average incomes coupled with relatively high levels of inequality, and relatively low average incomes coupled with relatively low levels of inequality appeared to be fairly general insofar as all of the definitions of gross farm income were concerned. In the northern census divisions of Alberta in 1970, gross farm incomes were relatively low but relatively equally distributed and in the southern census divisions gross farm incomes were relatively high but less equally distributed.

This trend did not appear with respect to the measurement of inequality on the basis of net farm cash income. When total expenses were subtracted from gross farm cash incomes, substantial changes occurred in the rank positions of census divisions as determined with respect to levels of equality. In fact, the distributional ranking of census divisions was largely reversed. This was attributed to the nature of the distribution of total expenses within and among census divisions. Specifically, total expenses as a proportion of total gross farm cash incomes were substantially higher in the northern census divisions than those in the south. Further, the tendency in the northern census divisions for total farm expenses relative to gross farm cash income to be disproportionately concentrated in the lower income classes provided additional impetus for the shifting of relative distributional positions. A further impact of this feature was the reduction of the level of equality of

farm income distribution within each of the census divisions. According to the net farm cash income definition of farm income, incomes were distributed most equally within census division four and most unequally within census division fourteen. In general, not only were net farm cash incomes on the average substantially lower in the northern census divisions than the south, but also levels of inequality tended to be higher. Such conditions as these may be of special concern to policy makers within the context of social welfare maximization.

When income in kind was added to net farm cash income, no substantial changes occurred in the distributional ranking of census divisions. Any changes which did occur tended to be towards the pattern shown in the ranking of census divisions according to gross farm income estimates. According to the net farm cash income plus income in kind definition of farm income, farm incomes were distributed most equally within census division four and least equally within census division fourteen. At the same time, the level of inequality within all census divisions, with the exception of census division nine, declined.

Finally, when off-farm labour income was added to net farm income, the original distributional ranking trend which applied with the definitions of gross farm income was resumed and the northern census divisions reported more equally distributed farm incomes that those in the south. This was explained with respect to the nature of the distri-

bution of off-farm labour income within and among the census divisions. As a result, the most equal distribution of net farm cash income plus off-farm labour income--as well as net farm cash income plus off-farm labour income plus income in kind--was in census division fourteen and the least equal distribution was in census division nine.

Reconciliation of Inequality Within and Among Census Divisions

An appropriate method by which to simultaneously consider the level and distribution of income within the context of social welfare analysis is to incorporate both considerations into a single statistic. Apart from the fact that all of the common measures of income distribution are framed in terms of deviations from equality--which in the welfare sense is generally a presumption in favour of the equalization of incomes--most measures exhibit constant inequality-aversion (independence of the mean). In fact, all of the common measures of inequality exhibit this property with the exception of the variance, which exhibits increasing inequality-aversion ; while none of the measures exhibit decreasing inequality-aversion. It may be the case, however, that policy makers prefer the latter property in a measure of the distribution of income. In the welfare sense, this implies that trade-offs occur between the level of inequality as measured by the Gini coefficient, and the level of average incomes among the census divisions. In the absence of a pre-specified welfare relationship between the level of inequality

of the distribution of farm income and the average level of farm income it is necessary for decision makers to evaluate the respective welfare positions of the census divisions in the light of planners preferences and the existing state of distributional information. This means that insofar as agricultural policy development is concerned the conclusions of this study must be interpreted with respect to normative distributional judgements and within the general goals of agricultural policy.

Recommendations

In the sections that follow three broad recommendations are presented and discussed. The three recommendations are:

1. There should be continuing study of the distribution of farm income in Alberta and the further identification and statistical testing of those socio-economic and physical factors which may be associated with particular distributional patterns and any changing trends in these.
2. More emphasis should be directed to the collection of reliable and complete data by which to measure and analyse the nature of farm income distribution in Alberta. This requires the expansion of both tax and agricultural census data bases.
3. More emphasis should be placed on the explicit incorporation of distributional criteria in policy

analysis. This requires the incorporation of distributional considerations into the tools of policy evaluation which are presently used.

Continuing Study

With respect to specific policy recommendations, a major limitation of this study is that the present agricultural situation in 1975 has in many ways changed substantially since 1970. As a result, specific target areas and specific agricultural policies which are based on 1970 income information may not be applicable in 1975. This is especially true in the light of the largely reversed situation of cereal grain producers vis-a-vis livestock producers. A major recommendation of this study is that the measurement of income distribution be undertaken on a continuing basis. Further, it is recommended that efforts be made to identify those factors, both socio-economic and physical, which are associated with particular income distribution patterns and changes in these. Continued study of farm income distribution would aid in the development of sound and timely agricultural policy.

To illustrate the above point, this study indicates that with respect to net farm cash income the northern census divisions of Alberta in 1970 appeared to be characterized by relatively low and relatively unequally distributed farm incomes vis-a-vis the southern region. This problem appeared to be due to relative inefficiency in the northern census

divisions--in the sense that relatively more farm operators experienced high cost-income ratios in those census divisions. It further appeared that in the northern census divisions, substantial economies reflected mainly in reduced costs were to be earned upon the adoption of some type of operational change. Indeed, it may be that efficiency oriented agricultural policy which is designed to exploit potential economies is required to alleviate the problems of both low and relatively unequally distributed farm incomes in the northern region of Alberta. Examination of the selected economic characteristics of census farms for the northern census divisions (see Tables B.1 and B.2 of Appendix B) revealed that important economies may be a result of farm size expansion. However, without further detailed study of the region and identification of the leading factors which contribute to profitable farm operation, it is impossible to suggest specific agricultural programs.

Collection of Data

Continued measurement of farm income distribution and the identification of the socio-economic and physical factors associated with particular income distribution patterns requires the continuous collection of complete and reliable data. In Chapter IV it was suggested that the 1971 Census of Agriculture was deficient with respect to estimates of both gross farm income and total farm expenses. Further, the 1971 Census of Agriculture failed to report net farm income estimates by net farm income classes. As a result, it was

suggested that taxation data would provide more accurate information for the measurement of income distribution. The use of such data would allow for continuing measurement on a yearly basis, something census data cannot offer. Therefore, it is recommended that annual taxation data be made available for research on farm income distribution; strict confidentiality with respect to this information would have to be maintained.

One problem with taxation data, however, is the limited extent to which soci-economic and physical factors which contribute to particular distributional patterns can be identified. In this respect, census data are clearly superior. Therefore, it is recommended that the census coverage of farm and off-farm income and farm expenses be extended. Two surveys, the Agricultural Enumerative Survey[1] and the Consumer Finance Survey[2], appear to have initiated such an extension. However, the data base covered to date has been insufficient for distributional analysis on a within province regional basis. An extension of these surveys to include a wider data base would prove valuable. Alternatively, in order to allow for yearly research on farm income distribution, either links could be established by which the the relationship between levels of income from taxation

---

[1] R.D. Bollman, "Off-Farm Work by Operators of Canadian Census-Farms--1971," Canadian Farm Economies 8 (December 1973): 1-5.

[2] Brian H. Davey and Zuhair A. Hassan, "Farm and Off-Farm Incomes of Farm Families in Canada," Canadian Farm Economies 9 (December 1974): 16-23.

sources and socio-economic and physical variables could be determined--recognizing the statistical and political problems involved; or yearly provincial farm surveys similar to the census could be conducted.

Income Distribution and Policy Formation

The role of the personal distribution of income in the theory of social welfare was discussed from an historical perspective in Chapter II. The conclusion was that the pursuit of general welfare optimizing conditions has traditionally concentrated on the conditions required to maximize total social economic output, with little or no emphasis on the distribution of output. As a result, the thrust of welfare economic theory has been placed upon efficiency or production criteria with distributional considerations tending generally to be considered independently.

This theoretical approach is reflected in the nature of economic analysis which is frequently used in public policy evaluation. It is thus commonly considered that questions of distribution enter from the political sphere and as such are reserved for politicians.[1] However,

[1] In recent years there has been increasing attention paid to methods of incorporating distributional considerations into the tools of economic analysis. This is particularily true of benefit-cost analysis. For example see Stephen A. Marglin, *Public Investment Criteria* (Cambridge: M.I.T. Press, 1967), and Burton Weisbrod, "Income Redistribution Effects and Benefit-Cost Analysis," in *Problems in Public Expenditures Analysis*, ed. Samuel B. Chase, Jr. (Washington: Brookings Institution, 1968), pp.177-222.

> the fact remains that distributional considerations are relevant to political leaders and others in decision - making positions. Therefore, when economists disregard these distributional considerations, they should not be surprised to find that their advice is not necessarily heeded by decision makers. If economists refuse to examine distributional aspects of government expenditure programs--whether because the task is difficult or because, as some argue, this takes them outside the bounds of economics--they will retard the development of positive models for predicting actual political-economic behavior, and they will retard development of normative decision rules for determining appropriate choices.[1]

While distributional considerations are important within the context of public policy analysis, they are frequently ignored due to the nature of the assumptions involved in traditional welfare economic theory. It is thus recommened that emphasis be placed upon the adoption of techniques by which distributional criteria are explicitly incorporated into public policy analysis.

Summary of the Study

This study focused on the measurement of the level and particularly the distribution of 1970 farm income in Alberta within the context of a welfare economics approach to agricultural policy development. The conclusions of the study were that serious disparities of income among Alberta farm operators existed in 1970. The recommendations are that continued study should be made of the distribution of farm

---

[1]Burton Weisbrod, "Income Redistribution Effects and Benefit-Cost Analysis," in Problems in Public Expenditures Analysis, ed. Samuel B. Chase, Jr. (Washington: Brookings Institution, 1968), p.184.

income, including the identification of socio-economic and physical variables which influence farm income distribution; that more emphasis should be directed to the collection of complete and reliable data on the distribution of farm income; and that more emphasis should be placed on the explicit incorporation of distributional criteria in policy analysis.

SELECTED BIBLIOGRAPHY

Arrow, Kenneth J., and Scitovsky, Tibor, comps. Readings in Welfare Economics. American Economic Association Series of Republished Articles on Economics, vol. 12. Homewood, Ill.: Richard D. Irwin, Inc.; Nobleton, Ont.: Irwin-Dorsey Ltd., for the American Economic Association, 1969.

Atkinson, Anthony B. "On the Measurement of Inequality." Journal of Economic Theory 2 (September 1970): 244-263.

Baumol, William J. Welfare Economics and the Theory of the State: with a new introduction Welfare and the State Revised. 2nd. ed. London: G. Belland Sons Ltd. for the London School of Economics and Political Science, University of London, 1965.

Benson, Richard A. "Gini Ratios: Some Considerations Affecting their Interpretation." American Journal of Agricultural Economics 52 (December 1970): 444-447.

Bollman, R.D. "Off-Farm Work by Operators of Canadian Census-Farms--1971." Canadian Farm Economics 8 (December 1973): 1-5.

Carlin, Thomas A. "Economic Position of Farm Families when Money Income and Net Worth are Combined." Agricultural Economics Research 25 (July 1973): 61-70.

Carlin, Thomas A., and Reinsel, Edward I. "Combining Income and Wealth: An Analysis of Farm Family 'Well-Being'." American Journal of Agricultural Economics 55 (February 1973): 38-44.

Davey, Brian H., and Hassan, Zuhair A. "Farm and Off-Farm Incomes of Farm Families in Canada." Canadian Farm Economics 9 (December 1974): 16-23.

Dalton, Hugh. "The Measurement of the Inequality of Incomes." Economic Journal 30 (September 1920): 348-361.

Dasgupta, Partha; Sen, Amartya; and Starrett, David. "Notes on the Measurement of Inequality." Journal of Economic Theory 6 (July 1972): 180-187.

Dobb, Maurice. Welfare Economics and the Economics of Socialism. Cambridge: Cambridge University Press, 1969.

Éltető, Ö, and Frigyes, E. "New Income Inequality Measures as Efficient Tools for Causal Analysis and Planning." Econometrica 36 (April 1968): 383-396.

Herfindahl, Orris C., and Kneese, Allen V. Economic Theory of Natural Resources. Resources for the Future, Inc. Columbus: Charles E. Merrill Publishing Co., 1974.

Mishan, E.J. Welfare Economics: Five Introductory Essays. Consulting ed. William Letwin. Random House Studies in Economics. New York: Random House, 1964.

Mishan, E.J. Welfare Economics: An Assesment. The Professor Dr. F. De Vries Lectures. Amsterdam and London: North-Holland Publishing Co., 1969.

Morgan, E. Victor, and Morgan, Ann D. The Economics of Public Policy. Edinburgh: Edinburgh University Press, 1972.

Page, Alfred N., comp. Utility Theory: A Book of Readings. New York, London and Sydney: John Wiley and Sons, Inc., 1968. pp.299-454.

Pareto, Vilfredo. Manual of Political Economy. Translated by Ann S. Schwier. Edited by Ann S. Schwier and Alfred N. Page. New York: Augustus M. Kelley, 1971.

Rothschild, Michael, and Stiglitz, Joseph E. "Some Further Results on the Measurement of Inequality." Journal of Economic Theory 6 (June 1972): 188-204.

Scitovsky, Tibor. Papers on Welfare and Growth. London: George Allen and Unwin Ltd., 1964.

Sen, Amartya. On Economic Inequality. The Radcliffe Lectures Delivered in the University of Warwick. Oxford: Clarendon Press, 1973.

Sen, Amartya. "Poverty, Inequality and Unemployment:Some Conceptual Issues in Measurement." Economic and Political Weekly 8 (August 1973): 1457-1464.

Shultz, Robert R. "On the Measurement of Income Inequality." American Journal of Economics 41 (March 1951): 107-122.

Tinbergen, Jan; Bergson, Abram; Machlup, Fritz; and Morgenstern, Oskar. Optimum Social Welfare and Productivity: A Comparitive View. The Charles C. Moskowitz Lectures, School of Commerce, New York University. New York: New York University Press, 1972.

Walras, Léon. Elements of Pure Economics. Translated by William Jaffé. Homewood, Ill.: Richard D. Irwin, Inc. for the American Economic Association and the Royal Economic Society, 1954.

Walker, Helen M., and Lev, Joseph. Elementary Statistical Methods. Revised ed. New York: Henry Holt and Co., 1958.

Weisbrod, Burton A., and Hansen, W. Lee. "An Income-Net Worth Approach to Measuring Economic Welfare." American Economic Review 58 (December 1968): 1315-1329.

Winch, D.M. Analytical Welfare Economics. Harmondsworth, Eng.: Penguin Books Ltd., 1971.

APPENDIX A

TABLE A.1

BASIC DATA BY ECONOMIC CLASS AND CENSUS DIVISION

Census Division 1

Economic class	Number of operators (R)	Total farm expenses (E)	Value of income in kind (K)	Value of Off-farm labour income (L)	Value of gross farm cash income (G)	Value of net farm cash income (N)
250 - 2,499	186	461,129	433,268	525,801	236,653	-224,476
2,500 - 4,999	182	684,102	423,958	327,232	584,255	- 99,847
5,000 - 9,999	433	2,504,515	1,008,693	435,933	2,789,697	285,182
10,000 -14,999	366	2,813,518	852,593	168,972	3,823,759	1,010,241
15,000 -24,999	398	4,670,178	927,158	105,216	6,628,149	1,957,971
25,000 -49,999	219	4,493,831	510,171	63,191	6,327,072	1,833,241
50,000 +	110	7,686,778	256,254	14,130	12,647,443	4,960,665
Total	1,894	23,314,051	4,412,095	1,640,475	33,037,028	9,722,977

Economic class	Gross farm cash income plus income in kind (G_K)	Net farm cash income plus income in kind (N_K)	Gross farm cash income plus off-farm labour income (G_L)	Net farm cash income plus off-farm labour income (N_L)	Gross farm cash income plus off-farm labour income plus income in kind (G_{LK})	Net farm cash income plus off-farm labour income plus income in kind (N_{LK})
250 - 2,499	669,921	208,792	762,454	301,325	1,195,722	734,593
2,500 - 4,999	1,008,213	324,111	911,487	227,385	1,335,445	651,343
5,000 - 9,999	3,798,390	1,293,875	3,225,630	721,115	4,234,323	1,729,808
10,000 -14,999	4,676,352	1,862,834	3,992,731	1,179,213	4,845,324	2,031,806
15,000 -24,999	7,555,307	2,885,129	6,733,365	2,063,187	7,660,523	2,990,345
25,000 -49,999	6,837,243	2,343,412	6,390,263	1,896,432	6,900,434	2,406,603
50,000 +	12,903,697	5,216,919	12,661,573	4,974,795	12,917,827	5,231,049
Total	37,449,123	14,135,072	34,677,503	11,363,452	39,089,598	15,775,547

TABLE A.1

BASIC DATA BY ECONOMIC CLASS AND CENSUS DIVISION

Census Division 2

Economc class	Number of operators (R)	Total farm expenses (E)	Value of income in kind (K)	Value of Off -farm labour income (L)	Value of gross farm cash income (G)	Value of net farm cash income (N)
250 - 2,499	370	1,079,476	1,337,994	1,075,599	413,719	-665,757
2,500 - 4,999	400	1,873,081	1,446,595	732,447	1,308,287	-564,794
5,000 - 9,999	790	5,326,471	2,858,242	857,169	5,057,475	-268,996
10,000 -14,999	587	5,437,150	2,123,344	390,552	6,232,069	794,919
15,000 -24,999	747	10,150,068	2,702,724	356,102	12,376,628	2,226,560
25,000 -49,999	583	14,262,124	2,109,364	171,607	17,338,662	3,076,538
50,000 +	362	35,090,825	1,309,984	105,947	61,266,027	26,175,202
Total	3,839	73,219,195	13,888,247	3,689,423	103,992,867	30,773,672

Economic class	Gross farm cash income plus income in kind (G_K)	Net farm cash income plus income in kind (N_K)	Gross farm cash income plus off-farm labour income (G_L)	Net farm cash income plus off-farm labour income (N_L)	Gross farm cash income plus off-farm labour income plus income in kind (G_{LK})	Net farm cash income plus off-farm labour income plus income in kind (N_{LK})
250 - 2,499	1,751,713	672,237	1,489,318	409,842	2,827,312	1,747,836
2,500 - 4,999	2,754,882	881,801	2,040,734	167,653	3,487,329	1,614,248
5,000 - 9,999	7,915,717	2,589,246	5,914,644	588,173	8,772,886	3,446,415
10,000 -14,999	8,355,413	2,918,263	6,622,621	1,185,471	8,745,965	3,308,815
15,000 -24,999	15,079,352	4,929,284	12,732,730	2,582,662	15,435,454	5,285,386
25,000 -49,999	19,448,026	5,185,902	17,510,269	3,248,145	19,619,633	5,357,509
50,000 +	62,576,011	27,485,186	61,371,974	26,281,149	62,681,958	27,591,133
Total	117,881,114	44,661,919	107,682,290	34,463,095	121,570,537	48,351,342

TABLE A.1

BASIC DATA BY ECONOMIC CLASS AND CENSUS DIVISION

Census Division 3

Economic class	Number of operators (R)	Total farm expenses (E)	Value of income in kind (K)	Value of off-farm labour income (L)	Value of gross farm cash income (G)	Value of net farm cash income (N)
250 - 2,499	227	541,677	682,579	570,398	261,484	-280,193
2,500 - 4,999	244	1,004,509	733,782	470,960	763,427	-241,082
5,000 - 9,999	413	2,751,680	1,241,915	542,815	2,593,995	-157,685
10,000 -14,999	331	2,971,589	995,452	297,023	3,500,884	529,295
15,000 -24,999	363	4,909,922	1,091,964	176,523	5,931,990	1,022,068
25,000 -49,999	286	6,227,326	860,405	126,110	8,584,935	2,357,609
50,000 +	186	13,981,691	559,393	40,284	24,529,448	10,547,757
Total	2,050	32,388,394	6,165,490	2,224,113	46,166,163	13,777,769

Economic class	Gross farm cash income plus income in kind (G_K)	Net farm cash income plus income in kind (N_K)	Gross farm cash income plus off-farm labour income (G_L)	Net farm cash income plus off-farm labour income (N_L)	Gross farm cash income plus off-farm labour income plus income in kind (G_{LK})	Net farm cash income plus off-farm labour income plus income in kind (N_{LK})
250 - 2,499	944,063	402,386	831,882	290,205	1,514,461	972,784
2,500 - 4,999	1,497,209	492,700	1,234,387	229,878	1,968,169	963,660
5,000 - 9,999	3,835,910	1,084,230	3,136,810	385,130	4,378,725	1,627,045
10,000 -14,999	4,496,336	1,524,747	3,797,907	826,318	4,793,359	1,821,770
15,000 -24,999	7,023,954	2,114,032	6,108,513	1,198,591	7,200,477	2,290,555
25,000 -49,999	9,445,340	3,218,014	8,711,045	2,483,719	9,571,450	3,344,124
50,000 +	25,088,841	11,107,150	24,569,732	10,588,041	25,129,125	11,147,434
Total	52,331,653	19,943,259	48,390,276	16,001,882	54,555,766	22,167,372

TABLE A.1

BASIC DATA BY ECONOMIC CLASS AND CENSUS DIVISION

Census Division 4

Economic class	Number of operators (R)	Total farm expenses (E)	Value of income in kind (K)	Value of off-farm labour income (L)	Value of gross farm cash income (G)	Value of net farm cash income (N)
250 - 2,499	127	270,612	230,339	193,993	161,107	-109,505
2,500 - 4,999	231	840,428	419,085	307,547	748,441	- 91,987
5,000 - 9,999	464	2,528,477	842,167	260,023	2,972,729	444,252
10,000 -14,999	309	2,458,440	560,727	134,091	3,254,955	796,515
15,000 -24,999	314	3,607,607	569,792	80,740	5,198,404	1,590,797
25,000 -49,999	191	3,744,172	346,838	47,770	5,461,445	1,717,273
50,000 +	65	3,484,019	117,966	12,337	5,317,212	1,833,193
Total	1,701					

Economic class	Gross farm cash income plus income in kind (G_K)	Net farm cash income plus income in kind (N_K)	Gross farm cash income plus off-farm labour income (G_L)	Net farm cash income plus off-farm labour income (N_L)	Gross farm cash income plus off-farm labour income plus income in kind (G_{LK})	Net farm cash income plus off-farm labour income plus income in kind (N_{LK})
250 - 2,499	391,446	120,834	355,100	84,488	585,439	314,827
2,500 - 4,999	1,167,526	327,098	1,055,988	215,560	1,475,073	634,645
5,000 - 9,999	3,814,896	1,286,419	3,232,752	704,275	4,074,919	1,546,442
10,000 -14,999	3,815,682	1,357,242	3,389,046	903,606	3,949,773	1,491,333
15,000 -24,999	5,768,196	2,160,589	5,279,144	1,671,537	5,848,936	2,231,329
25,000 -49,999	5,808,283	2,064,111	5,509,215	1,765,043	5,856,053	2,111,881
50,000 +	5,435,178	1,951,159	5,329,549	1,845,530	5,447,515	1,963,496
Total	26,201,207	9,267,452	24,150,794	7,217,039	27,237,708	10,303,953

TABLE A.1

BASIC DATA BY ECONOMIC CLASS AND CENSUS DIVISION

Census Division 5

Economic class	Number of operators (R)	Total farm expenses (E)	Value of income in kind (K)	Value of off -farm labour income (L)	Value of gross farm cash income (G)	Value of net farm cash income (N)
250 - 2,499	240	649,312	608,102	558,555	311,826	-337,486
2,500 - 4,999	337	1,567,859	854,160	528,780	1,085,393	-482,466
5,000 - 9,999	725	5,107,663	1,838,830	694,318	4,624,080	-483,583
10,000 -14,999	648	6,330,531	1,643,279	400,036	6,830,180	499,649
15,000 -24,999	756	10,473,382	1,916,583	202,695	12,546,982	2,073,600
25,000 -49,999	541	11,397,963	1,372,100	127,361	15,714,544	4,316,581
50,000 +	262	16,703,415	665,301	30,011	25,516,395	8,812,980
Total	3,509	52,230,125	8,898,355	2,541,756	66,629,400	14,399,275

Economic class	Gross farm cash income plus income in kind (G_K)	Net farm cash income plus income in kind (N_K)	Gross farm cash income plus off-farm labour income (G_L)	Net farm cash income plus off-farm labour income (N_L)	Gross farm cash income plus off-farm labour income plus income in kind (G_{LK})	Net farm cash income plus off-farm labour income plus income in kind (N_{LK})
250 - 2,499	919,928	270.616	870,381	221,069	1,478,483	829,171
2,500 - 4,999	1,939,553	371,694	1,614,173	46,314	2,468,333	900,474
5,000 - 9,999	6,462,910	1,355,247	5,318,398	210,735	7,157,228	2,049,565
10,000 -14,999	8,473,459	2,142,928	7,230,216	899,685	8,873,495	2,542,964
15,000 -24,999	14,463,565	3,990,183	12,749,677	2,276,295	14,666,260	4,192,878
25,000 -49,999	17,086,644	5,688,681	15,841,905	4,443,942	17,214,005	5,816,042
50,000 +	26,181,696	9,478,281	25,546,406	8,842,991	26,211,707	9,508,292
Total	75,527,755	23,297,630	69,171,156	16,941,031	78,069,511	25,839,386

TABLE A.1

BASIC DATA BY ECONOMIC CLASS AND CENSUS DIVISION

Census Division 6

Economic class	Number of operators (R)	Total farm expenses (E)	Value of income in kind (K)	Value of off-farm labour income (L)	Value of gross farm cash income (G)	Value of net farm cash income (N)
250 - 2,499	623	1,854,515	1,596,496	1,803,604	673,327	-1,181,188
2,500 - 4,999	513	2,563,027	1,315,521	1,031,600	1,611,857	- 951,170
5,000 - 9,999	789	5,460,566	2,022,654	944,988	5,031,990	- 428,576
10,000 -14,999	566	5,391,283	1,450,687	368,339	5,958,292	567,009
15,000 -24,999	608	8,152,464	1,559,055	275,850	10,084,616	1,932,152
25,000 -49,999	549	12,274,752	1,407,031	111,447	16,717,764	4,443,012
50,000 +	334	22,738,722	855,457	65,770	36,349,711	13,610,989
Total	3,982	58,435,329	10,206,901	4,601,598	76,427,557	17,992,228

Economic class	Gross farm cash income plus income in kind (G_K)	Net farm cash income plus income in kind (N_K)	Gross farm cash income plus off-farm labour income (G_L)	Net farm cash income plus off-farm labour income (N_L)	Gross farm cash income plus off-farm labour income plus income in kind (G_{LK})	Net farm cash income plus off-farm labour income plus income in kind (N_{LK})
250 - 2,499	2,269,823	415,308	2,476,931	622,416	4,073,427	2,218,912
2,500 - 4,999	2,927,378	364,351	2,643,457	80,430	3,958,978	1,395,951
5,000 - 9,999	7,054,644	1,594,078	5,976,978	516,412	7,999,632	2,539,066
10,000 -14,999	7,408,979	2,017,696	6,326,631	935,348	7,777,318	2,386,035
15,000 -24,999	11,643,671	3,491,207	10,360,466	2,208,002	11,919,521	3,767,057
25,000 -49,999	18,124,795	5,850,043	16,829,211	4,554,459	18,236,242	5,961,490
50,000 +	37,205,168	14,466,446	36,415,481	13,676,759	37,270,938	14,532,216
Total	86,634,458	28,199,129	81,029,155	22,593,826	91,236,056	32,800,727

TABLE A. 1

BASIC DATA BY ECONOMIC CLASS AND CENSUS DIVISION

Census Division 7

Economic class	Number of operators (R)	Total farm expenses (E)	Value of income in kind (K)	Value of off-farm labour income (L)	Value of gross farm cash income (G)	Value of net farm cash income (N)
250 - 2,499	458	1,073,386	797,728	947,125	557,425	-515,961
2,500 - 4,999	598	2,360,844	1,042,549	780,313	1,932,735	-428,109
5,000 - 9,999	1,080	6,432,682	1,881,979	689,549	6,821,513	388,831
10,000 -14,999	744	6,338,404	1,290,555	378,640	7,830,654	1,492,250
15,000 -24,999	714	8,711,937	1,244,235	168,765	11,629,102	2,917,165
25,000 -49,999	402	7,774,262	700,544	70,607	11,618,749	3,844,487
50,000 +	180	7,451,794	313,452	52,995	14,099,101	6,647,307
Total	4,176	40,143,309	7,277,042	3,087,994	54,489,279	14,345,970

Economic class	Gross farm cash income plus income in kind (G_K)	Net farm cash income plus income in kind (N_K)	Gross farm cash income plus off-farm labour income (G_L)	Net farm cash income plus off-farm labour income (N_L)	Gross farm cash income plus off-farm labour income plus income in kind (G_{LK})	Net farm cash income plus off-farm labour income plus income in kind (N_{LK})
250 - 2,499	1,355,153	281,767	1,504,550	431,164	2,302,278	1,228,892
2,500 - 4,999	2,975,284	614,440	2,713,048	352,204	3,755,597	1,394,753
5,000 - 9,999	8,703,492	2,270,810	7,511,062	1,078,380	9,393,041	2,960,359
10,000 -14,999	9,127,209	2,788,805	8,209,294	1,870,890	9,505,849	3,167,445
15,000 -24,999	12,873,337	4,161,400	11,797,867	3,085,930	13,042,102	4,330,165
25,000 -49,999	12,319,293	4,545,031	11,689,356	3,915,094	12,389,900	4,615,638
50,000 +	14,412,553	6,960,759	14,152,096	6,700,302	14,465,548	7,013,754
Total	61,766,321	21,623,012	57,577,273	17,433,964	64,854,315	24,711,006

TABLE A. 1

BASIC DATA BY ECONOMIC CLASS AND CENSUS DIVISION

Census Division 8

Economic class	Number of operators (R)	Total farm expenses (E)	Value of income in kind (K)	Value of off-farm labour income (L)	Value of gross farm cash income (G)	Value of net farm cash income (N)
250 - 2,499	1,051	2,399,458	1,736,142	2,782,450	1,148,250	-1,251,208
2,500 - 4,999	959	3,768,661	1,584,060	1,502,038	3,024,892	- 743,769
5,000 - 9,999	1,345	7,514,884	2,221,718	1,121,930	8,464,476	949,592
10,000 -14,999	823	6,952,729	1,359,614	474,820	8,669,938	1,717,209
15,000 -24,999	701	8,927,661	1,158,268	206,319	11,466,692	2,539,031
25,000 -49,999	426	8,917,705	703,227	103,567	12,392,988	3,475,283
50,000 +	250	13,800,182	414,038	57,476	23,549,083	6,748,901
Total	5,555	52,281,280	9,177,067	6,248,600	68,716,319	16,435,039

Economic class	Gross farm cash income plus income in kind (G_K)	Net farm cash income plus income in kind (N_K)	Gross farm cash income plus off-farm labour income (G_L)	Net farm cash income plus off-farm labour income (N_L)	Gross farm cash income plus off-farm labour income plus income in kind (G_{LK})	Net farm cash income plus off-farm labour income plus income in kind (N_{LK})
250 - 2,499	2,884,392	484,934	3,930,700	1,531,242	5,666,842	3,267,384
2,500 - 4,999	4,608,952	840,291	4,526,930	758,269	6,110,990	2,342,329
5,000 - 9,999	10,686,194	3,171,310	9,586,406	2,071,522	11,808,124	4,293,240
10,000 -14,999	10,029,552	3,076,823	9,144,758	2,192,029	10,504,372	3,551,643
15,000 -24,999	12,624,960	3,697,299	11,673,011	2,745,350	12,831,279	3,903,618
25,000 -49,999	13,096,215	4,178,510	12,496,555	3,578,850	13,199,782	4,282,077
50,000 +	23,963,121	10,162,939	23,606,559	9,806,377	24,020,597	10,220,415
Total	77,893,386	25,612,106	74,964,919	22,683,639	84,141,986	31,860,706

TABLE A.1

BASIC DATA BY ECONOMIC CLASS AND CENSUS DIVISION

Census Division 9

Economic class	Number of operators (R)	Total farm expenses (E)	Value of income in kind (K)	Value of off-farm labour income (L)	Value of gross farm cash income (G)	Value of net farm cash income (N)
250 - 2,499	19	23,199	40,280	41,271	13,921	- 9,278
2,500 - 4,999	6	25,188	12,716	17,444	19,043	- 6,145
5,000 - 9,999	15	115,114	31,798	14,829	96,685	- 18,429
10,000 -14,999	4	50,405	8,483	---	40,176	- 10,229
15,000 -24,999	4	69,068	8,476	6,664	64,282	- 4,786
25,000 -49,999	6	158,126	12,715	7,014	175,983	17,857
50,000 +	7	612,373	14,825	384	558,017	- 54,356
Total	61	1,053,473	129,293	87,696	968,107	- 85,365

Economic class	Gross farm cash income plus income in kind (G_K)	Net farm cash income plus income in kind (N_K)	Gross farm cash income plus off-farm labour income (G_L)	Net farm cash income plus off-farm labour income (N_L)	Gross farm cash income plus off-farm labour income plus income in kind (G_{LK})	Net farm cash income plus off-farm labour income plus income in kind (N_{LK})
250 - 2,499	54,201	31,002	55,192	31,993	95,472	72,273
2,500 - 4,999	31,759	6,571	36,487	11,299	49,203	24,015
5,000 - 9,999	128,483	13,369	111,514	- 3,600	143,312	28,198
10,000 -14,999	48,659	- 1,746	40,176	- 10,229	48,659	- 1,746
15,000 -24,999	72,758	3,690	70,946	1,878	79,422	10,354
25,000 -49,999	188,698	30,572	183,087	24,961	195,802	37,676
50,000 +	572,842	- 39,531	558,401	- 53,972	573,226	- 39,147
Total	1,097,400	43,927	1,055,803	2,330	1,185,096	131,623

TABLE A.1

BASIC DATA BY ECONOMIC CLASS AND CENSUS DIVISION

Census Division 10

Economic class	Number of operators (R)	Total farm expenses (E)	Value of income in kind (K)	Value of off-farm labour income (L)	Value of gross farm cash income (G)	Value of net farm cash income (N)
250 - 2,499	1,688	4,108,180	1,939,838	3,535,921	1,959,588	-2,148,592
2,500 - 4,999	1,654	6,621,465	1,900,345	1,960,933	5,254,881	-1,366,584
5,000 - 9,999	2,227	13,199,522	2,558,178	1,381,235	13,883,301	687,809
10,000 -14,999	1,116	9,452,161	1,281,432	400,838	11,593,422	2,141,261
15,000 -24,999	814	10,408,208	934,838	289,685	13,347,357	2,939,149
50,000 -49,000	407	7,821,895	468,035	95,329	11,585,805	3,763,910
50,000 +	144	6,695,020	164,790	32,295	11,619,042	4,924,022
Total	8,050	58,302,422	9,247,456	7,696,236	69,243,396	10,940,974

Economic class	Gross farm cash income plus income in kind (G_K)	Net farm cash income plus income in kind (N_K)	Gross farm cash income plus off-farm labour income (G_L)	Net farm cash income plus off-farm labour income (N_L)	Gross farm cash income plus off-farm labour income plus income in kind (G_{LK})	Net farm cash income plus off-farm labour income plus income in kind (N_{LK})
250 - 2,499	3,899,426	- 208,754	5,495,509	1,387,329	7,435,347	3,327,167
2,500 - 4,999	7,155,226	533,761	7,215,814	594,349	9,116,159	2,494,694
5,000 - 9,999	16,441,479	3,245,987	15,264,536	2,069,044	17,822,714	4,627,222
10,000 -14,999	12,874,854	3,422,693	11,994,260	2,542,099	13,275,692	3,823,531
15,000 -24,999	14,282,195	3,873,987	13,637,042	3,228,834	14,571,880	4,163,672
25,000 -49,999	12,053,840	4,231,945	11,681,134	3,859,239	12,149,169	4,327,274
50,000 +	11,783,832	5,088,812	11,651,337	4,956,317	11,816,127	5,121,107
Total	78,490,852	20,188,430	76,939,632	18,637,21C	86,187,088	27,884,666

TABLE A.1

BASIC DATA BY ECONOMIC CLASS AND CENSUS DIVISION

Census Division 11

Economic class	Number of operators (R)	Total farm expenses (E)	Value of income in kind (K)	Value of off -farm labour income (L)	Value of gross farm cash income (G)	Value of net farm cash income (N)
250 - 2,499	1,956	5,282,160	2,426,755	5,734,653	2,034,783	- 3,247,377
2,500 - 4,999	1,258	5,388,936	1,561,051	2,445,392	3,935,265	- 1,453,671
5,000 - 9,999	1,484	9,276,101	1,841,180	1,665,558	9,172,995	- 103,106
10,000 -14,999	781	7,135,572	969,046	557,534	8,148,635	1,013,063
15,000 -24,999	728	9,765,150	902,944	441,830	11,933,762	2,168,612
25,000 -49,999	436	9,733,501	540,656	159,077	12,662,280	2,928,779
50,000 +	176	12,960,784	218,681	88,174	15,461,690	2,500,906
Total	6,819	59,542,205	8,460,313	11,092,218	63,349,410	3,807,205

Economic class	Gross farm cash income plus income in kind (G_K)	Net farm cash income plus income in kind (N_K)	Gross farm cash income plus off-farm labour income (G_L)	Net farm cash income plus off-farm labour income (N_L)	Gross farm cash income plus off-farm labour income plus income in kind (G_{LK})	Net farm cash income plus off-farm labour income plus income in kind (N_{LK})
250 - 2,499	4,461,538	- 820,622	7,769,436	2,487,276	10,196,191	4,914,031
2,500 - 4,999	5,496,316	107,380	6,380,657	991,721	7,941,708	2,552,772
5,000 - 9,999	11,014,175	1,738,074	10,838,553	1,562,452	12,679,733	3,403,632
10,000 -14,999	9,117,681	1,982,109	8,706,169	1,570,597	9,675,215	2,539,643
15,000 -24,999	12,836,706	3,071,556	12,375,592	2,610,442	13,278,536	3,513,386
25,000 -49,999	13,202,936	3,469,435	12,821,357	3,087,856	13,362,013	3,628,512
50,000 +	15,680,371	2,719,587	15,549,864	2,589,080	15,768,545	2,807,761
Total	71,809,723	12,267,518	74,441,628	14,899,423	82,901,941	23,359,736

TABLE A.1

BASIC DATA BY ECONOMIC CLASS AND CENSUS DIVISION

Census Division 12

Economic class	Number of operators (R)	Total farm expenses (E)	Value of income in kind (K)	Value of off-farm labour income (L)	Value of gross farm cash income (G)	Value of net farm cash income (N)
250 - 2,499	1,011	2,288,266	773,973	2,040,230	1,100,883	-1,187,383
2,500 - 4,999	705	2,821,949	539,839	869,964	2,222,007	- 599,942
5,000 - 9,999	895	5,123,019	685,319	580,384	5,428,736	305,717
10,000 -14,999	320	2,752,411	244,939	127,590	3,310,672	558,261
15,000 -24,999	159	1,953,728	121,810	70,662	2,531,100	577,372
25,000 -49,999	67	1,392,293	51,389	17,835	1,862,948	470,655
50,000 +	24	914,258	18,093	1,718	1,779,247	864,989
Total	3,181	17,245,924	2,435,362	3,708,383	18,235,593	989,669

Economic class	Gross farm cash income plus income in kind (G_K)	Net farm cash income plus income in kind (N_K)	Gross farm cash income plus off-farm labour income (G_L)	Net farm cash income plus off-farm labour income (N_L)	Gross farm cash income plus off-farm labour income plus income in kind (G_{LK})	Net farm cash income plus off-farm labour income plus income in kind (N_{LK})
250 - 2,499	1,874,856	- 413,410	3,141,113	852,847	3,915,086	1,626,820
2,500 - 4,999	2,761,846	- 60,103	3,091,971	270,022	3,631,810	809,861
5,000 - 9,999	6,114,055	991,036	6,009,120	886,101	6,694,439	1,571,420
10,000 -14,999	3,555,611	803,200	3,438,262	685,851	3,683,201	930,790
15,000 -24,999	2,652,910	699,182	2,601,762	648,034	2,723,572	769,844
25,000 -49,999	1,914,337	522,044	1,880,783	488,490	1,932,172	539,879
50,000 +	1,797,340	883,082	1,780,965	866,707	1,799,058	884,800
Total	20,670,955	3,425,031	21,943,976	4,698,052	24,379,338	7,133,414

TABLE A.1

BASIC DATA BY ECONOMIC CLASS AND CENSUS DIVISION

Census Division 13

Economic class	Number of operators (R)	Total farm expenses (E)	Value of income in kind (K)	Value of off -farm labour income (L)	Value of gross farm cash income (G)	Value of net farm cash income (N)
250 - 2,499	1,490	3,445,251	1,470,170	3,134,730	1,660,357	-1,784,894
2,500 - 4,999	1,248	4,877,247	1,231,142	1,586,942	3,941,976	- 935,271
5,000 - 9,999	1,465	8,307,356	1,445,088	1,272,312	8,959,257	651,901
10,000 -14,999	597	4,837,292	589,168	282,390	6,186,570	1,349,278
15,000 -24,999	440	5,285,185	433,748	148,515	7,042,991	1,757,806
25,000 -49,999	177	3,370,210	174,506	53,036	5,188,159	1,817,949
50,000 +	91	4,357,286	89,668	52,406	7,705,751	3,348,465
Total	5,508	34,479,827	5,433,490	6,530,331	40,685,061	6,205,234

Economic class	Gross farm cash income plus income in kind (G_K)	Net farm cash income plus income in kind (N_K)	Gross farm cash income plus off-farm labour income (G_L)	Net farm cash income plus off-farm labour income (N_L)	Gross farm cash income plus off-farm labour income plus income in kind (G_{LK})	Net farm cash income plus off-farm labour income plus income in kind (N_{LK})
250 - 2,499	3,130,527	- 314,724	4,795,087	1,349,836	6,265,257	2,820,006
2,500 - 4,999	5,173,118	295,871	5,528,918	651,671	6,760,060	1,882,813
5,000 - 9,999	10,404,345	2,096,989	10,231,569	1,924,213	11,676,657	3,369,301
10,000 -14,999	6,775,738	1,938,446	6,468,960	1,631,668	7,058,128	2,220,836
15,000 -24,999	7,476,739	2,191,554	7,191,506	1,906,321	7,625,254	2,340,069
25,000 -49,999	5,362,665	1,992,455	5,241,195	1,870,985	5,415,701	2,045,491
50,000 +	7,795,419	3,438,133	7,758,157	3,400,871	7,847,825	3,490,539
Total	46,118,551	11,638,724	47,215,392	12,735,565	52,648,882	18,169,055

TABLE A.1

BASIC DATA BY ECONOMIC CLASS AND CENSUS DIVISION

Census Division 14

Economic class	Number of operators (R)	Total farm expenses (E)	Value of income in kind (K)	Value of off-farm labour income (L)	Value of gross farm cash income (G)	Value of net farm cash income (N)
250 - 2,499	355	859,463	212,080	909,588	351,214	-508,249
2,500 - 4,999	192	680,758	114,730	280,662	604,598	- 76,160
5,000 - 9,999	153	842,479	91,398	156,510	924,979	82,500
10,000 -14,999	42	337,485	25,082	16,158	433,840	96,355
15,000 -24,999	38	476,744	22,687	17,811	607,973	131,229
25,000 -49,999	8	156,434	4,794	3,950	230,365	73,931
50,000 +	6	302,543	3,639	--	399,312	96,769
Total	794	3,655,906	474,410	1,384,679	3,552,281	-103,625

Economic class	Gross farm cash income plus income in kind (G_K)	Net farm cash income plus income in kind (N_K)	Gross farm cash income plus off-farm labour income (G_L)	Net farm cash income plus off-farm labour income (N_L)	Gross farm cash income plus off-farm labour income plus income in kind (G_{LK})	Net farm cash income plus off-farm labour income plus income in kind (N_{LK})
250 - 2,499	503,294	- 296,169	1,260,802	401,339	1,472,882	613,419
2,500 - 4,999	719,328	38,570	885,260	204,502	999,990	319,232
5,000 - 9,999	1,016,377	173,898	1,081,489	239,010	1,172,887	330,408
10,000 -14,999	458,922	121,437	449,998	112,513	475,080	137,595
15,000 -24,999	630,660	153,916	625,784	149,040	648,471	171,727
25,000 -49,999	235,159	78,725	234,315	77,881	239,109	82,675
50,000 +	402,951	100,408	399,312	96,769	402,951	100,408
Total	4,026,691	370,785	4,936,960	1,281,054	5,411,370	1,755,464

TABLE A.1

BASIC DATA BY ECONOMIC CLASS AND CENSUS DIVISION

Census Division 15

Economic class	Number of operators (R)	Total farm expenses (E)	Value of income in kind (K)	Value of off-farm labour income (L)	Value of gross farm cash income (G)	Value of net farm cash income (N)
250 - 2,499	2,367	5,953,790	1,829,391	6,016,064	2,590,190	-3,363,600
2,500 - 4,999	1,771	7,524,893	1,368,594	3,360,862	5,511,172	-2,013,721
5,000 - 9,999	1,968	12,384,375	1,520,434	2,625,401	12,017,795	- 366,580
10,000 -14,999	773	7,561,050	597,257	631,738	8,054,419	493,309
15,000 -24,999	508	6,818,617	392,610	356,122	8,108,381	1,289,764
25,000 -49,999	156	3,510,909	120,887	70,822	4,498,612	987,703
50,000 +	39	1,928,387	29,903	12,796	3,091,205	1,162,818
Total	7,582	45,682,021	5,859,076	13,073,805	43,871,774	-1,810,247

Economic class	Gross farm cash income plus income in kind (G_K)	Net farm cash income plus income in kind (N_K)	Gross farm cash income plus off-farm labour income (G_L)	Net farm cash income plus off-farm labour income (N_L)	Gross farm cash income plus off-farm labour income plus income in kind (G_{LK})	Net farm cash income plus off-farm labour income plus income in kind (N_{LK})
250 - 2,499	4,419,581	-1,534,209	8,606,254	2,652,464	10,435,645	4,481,855
2,500 - 4,999	6,879,766	- 645,127	8,872,034	1,347,141	10,240,628	2,715,735
5,000 - 9,999	13,538,229	1,153,854	14,643,196	2,258,821	16,163,630	3,779,255
10,000 -14,999	8,651,676	1,090,626	8,686,157	1,125,107	9,283,414	1,722,364
15,000 -24,999	8,500,991	1,682,374	8,464,503	1,645,886	8,857,113	2,038,496
25,000 -49,999	4,619,499	1,108,590	4,569,434	1,058,525	4,690,321	1,179,412
50,000 +	3,121,108	1,192,721	3,104,001	1,175,614	3,133,904	1,205,517
Total	49,730,860	4,048,829	56,945,579	11,263,558	62,804,655	17,122,634

TABLE A.1

BASIC DATA BY ECONOMIC CLASS AND CENSUS DIVISION

Alberta

Economic class	Number of operators (R)	Total farm expenses (E)	Value of income in kind (K)	Value of off -farm labour income (L)	Value of gross farm cash income (G)	Value of net farm cash income (N)
250 - 2,499	12,168	30,289,876	19,724,907	29,869,980	13,475,474	-16,814,402
2,500 - 4,999	10,298	42,602,949	16,689,574	16,203,117	32,548,583	-10,054,366
5,000 - 9,999	14,246	86,870,875	23,093,270	13,242,952	88,839,680	1,968,805
10,000 -14,999	8,007	70,820,018	12,978,665	4,628,722	83,867,653	13,047,635
15,000 -24,999	7,292	94,417,380	11,817,817	2,903,496	119,497,533	25,080,153
25,000 -49,999	4,454	95,198,040	7,221,999	1,228,816	130,360,273	35,162,233
50,000 +	2,236	148,708,073	3,625,272	566,723	243,889,334	95,181,261
Total	58,701	568,907,211	95,151,507	68,643,806	712,478,528	143,571,317

Economic class	Gross farm cash income plus income in kind (G_K)	Net farm cash income plus income in kind (N_K)	Gross farm cash income plus off-farm labour income (G_L)	Net farm cash income plus off-farm labour income (N_L)	Gross farm cash income plus off-farm labour income plus income in kind (G_{LK})	Net farm cash income plus off-farm labour income plus income in kind (N_{LK})
250 - 2,499	33,200,381	2,910,505	43,345,454	13,055,578	63,070,361	32,780,485
2,500 - 4,999	49,238,157	6,635,208	48,751,700	6,148,751	65,441,274	22,838,325
5,000 - 9,999	111,932,950	25,062,075	102,082,632	15,211,757	125,175,902	38,305,027
10,000 -14,999	96,846,318	26,026,300	88,496,375	17,676,357	101,475,040	30,655,022
15,000 -24,999	131,315,350	36,897,970	122,401,029	27,983,649	134,218,846	39,801,466
25,000 -49,999	137,582,272	42,384,232	131,589,089	36,391,049	138,811,088	43,613,048
50,000 +	247,514,606	98,806,533	244,456,057	95,747,984	248,081,329	99,373,256
Total	807,630,035	238,722,824	781,122,336	212,215,123	876,273,840	307,366,630

TABLE A.2

AVERAGED BASIC DATA BY ECONOMIC CLASS AND CENSUS DIVISION

Census Division 1

Economic Class	G	G_L	G_K	G_{LK}	N	N_L	N_K	N_{LK}
250 - 2,499	1,272	4,099	3,602	6,429	-1,207	1,620	1,123	3,950
2,500 - 4,999	3,210	5,008	5,540	7,338	- 549	1,249	1,781	3,579
5,000 - 9,999	6,443	7,449	8,773	9,779	659	1,665	2,989	3,995
10,000 -14,999	10,447	10,909	12,777	13,239	2,760	3,222	5,090	5,552
15,000 -24,999	16,654	16,918	18,984	19,248	4,920	5,184	7,250	7,514
25,000 -49,999	28,891	29,179	31,221	31,509	8,371	8,660	10,701	10,990
50,000 +	114,977	115,105	117,307	117,435	45,097	45,225	47,427	47,555
All Classes	17,443	18,309	19,773	20,639	5,134	6,000	7,464	8,330

Census Division 2

Economic Class	G	G_L	G_K	G_{LK}	N	N_L	N_K	N_{LK}
250 - 2,499	1,118	4,025	4,736	7,643	-1,799	1,108	1,819	4,726
2,500 - 4,999	3,271	5,102	6,889	8,720	-1,412	419	2,206	4,037
5,000 - 9,999	6,402	7,487	10,020	11,105	- 341	745	3,277	4,363
10,000 -14,999	10,617	11,282	14,235	14,900	1,354	2,020	4,972	5,638
15,000 -24,999	16,568	17,045	20,186	20,663	2,981	3,457	6,599	7,075
25,000 -49,999	29,740	30,035	33,358	33,653	5,277	5,571	8,895	9,189
50,000 +	169,243	169,536	172,861	173,154	72,307	72,600	75,925	76,218
All Classes	27,089	28,050	30,707	31,668	8,016	8,977	11,634	12,595

TABLE A.2

AVERAGED BASIC DATA BY ECONOMIC CLASS AND CENSUS DIVISION

Census Division 3

Economic Class	G	G_L	G_K	G_{LK}	N	N_L	N_K	N_{LK}
250 - 2,499	1,152	3,665	4,160	6,673	-1,234	1,278	1,774	4,286
2,500 - 4,999	3,129	5,059	6,137	8,067	- 988	942	2,020	3,950
5,000 - 9,999	6,281	7,595	9,289	10,603	- 382	933	2,626	3,941
10,000 -14,999	10,577	11,474	13,585	14,482	1,599	2,496	4,607	5,504
15,000 -24,999	16,342	16,828	19,350	19,836	2,816	3,302	5,824	6,310
25,000 -49,999	30,017	30,458	33,025	33,466	8,243	8,684	11,251	11,692
50,000 +	131,879	132,095	134,887	135,103	56,708	56,925	59,716	59,933
All Classes	22,520	23,605	25,528	26,613	6,721	7,806	9,729	10,814

Census Division 4

Economic Class	G	G_L	G_K	G_{LK}	N	N_L	N_K	N_{LK}
250 - 2,499	1,269	2,796	3,084	4,611	- 862	665	953	2,480
2,500 - 4,999	3,240	4,571	5,055	6,386	- 398	933	1,417	2,748
5,000 - 9,999	6,407	6,967	8,222	8,782	957	1,518	2,772	3,333
10,000 -14,999	10,534	10,968	12,349	12,783	2,578	3,012	4,393	4,827
15,000 -24,999	16,555	16,813	18,370	18,628	5,066	5,323	6,881	7,138
25,000 -49,999	28,594	28,844	30,409	30,659	8,991	9,241	10,806	11,056
50,000 +	81,803	81,993	83,618	83,808	28,203	28,393	30,018	30,208
All Classes	13,589	14,198	15,404	16,013	3,633	4,243	5,448	6,058

TABLE A.2

AVERAGED BASIC DATA BY ECONOMIC CLASS AND CENSUS DIVISION

Census Division 5

Economic Class	G	G_L	G_K	G_{LK}	N	N_L	N_K	N_{LK}
250 - 2,499	1,299	3,627	3,835	6,163	-1,406	921	1,130	3,457
2,500 - 4,999	3,221	4,790	5,757	7,326	-1,432	137	1,104	2,673
5,000 - 9,999	6,378	7,336	8,914	9,872	- 667	291	1,869	2,827
10,000 -14,999	10,540	11,158	13,076	13,694	771	1,388	3,307	3,924
15,000 -24,999	16,597	16,865	19,133	19,401	2,743	3,011	5,279	5,547
25,000 -49,000	29,047	29,283	31,583	31,819	7,979	8,214	10,515	10,750
50,000 +	97,391	97,505	99,927	100,041	33,637	33,752	36,173	36,288
All Classes	18,988	19,712	21,524	22,248	4,104	4,828	6,640	7,364

Census Division 6

Economic Class	G	G_L	G_K	G_{LK}	N	N_L	N_K	N_{LK}
250 - 2,499	1,081	3,976	3,644	6,539	-1,896	999	667	3,562
2,500 - 4,999	3,142	5,153	5,705	7,716	-1,854	157	709	2,720
5,000 - 9,999	6,378	7,575	8,941	10,138	- 543	655	2,020	3,218
10,000 -14,999	10,527	11,178	13,090	13,741	1,002	1,653	3,565	4,216
15,000 -24,999	16,587	17,040	19,150	19,603	3,178	3,632	5,741	6,195
25,000 -49,999	30,451	30,654	33,014	33,217	8,093	8,296	10,656	10,859
50,000 +	108,831	109,028	111,394	111,591	40,751	40,948	43,314	43,511
All Classes	19,193	20,349	21,756	22,912	4,518	5,674	7,081	8,237

TABLE A.2

AVERAGED BASIC DATA BY ECONOMIC CLASS AND CENSUS DIVISION

Census Division 7

Economic Class	G	G_L	G_K	G_{LK}	N	N_L	N_K	N_{LK}
250 - 2,499	1,217	3,285	2,960	5,028	-1,127	941	616	2,684
2,500 - 4,999	3,232	4,537	4,975	6,280	- 716	589	1,027	2,332
5,000 - 9,999	6,316	6,955	8,059	8,698	360	999	2,103	2,742
10,000 -14,999	10,525	11,034	12,268	12,777	2,006	2,515	3,749	4,258
15,000 -24,999	16,287	16,524	18,030	18,267	4,086	4,322	5,829	6,065
25,000 -49,999	28,902	29,078	30,645	30,821	9,563	9,739	11,306	11,482
50,000 +	78,328	78,623	80,071	80,366	36,929	37,224	38,672	38,967
All Classes	13,048	13,788	14,791	15,531	3,435	4,175	5,178	5,918

Census Division 8

Economic Class	G	G_L	G_K	G_{LK}	N	N_L	N_K	N_{LK}
250 - 2,499	1,093	3,740	2,745	5,392	-1,190	1,457	462	3,109
2,500 - 4,999	3,154	4,720	4,806	6,372	- 776	791	876	2,443
5,000 - 9,999	6,293	7,127	7,945	8,779	706	1,540	2,358	3,192
10,000 -14,999	10,535	11,111	12,187	12,763	2,087	2,663	3,739	4,315
15,000 -24,999	16,358	16,652	18,010	18,304	3,622	3,916	5,274	5,568
25,000 -49,999	29,092	29,335	30,744	30,987	8,158	8,401	9,810	10,053
50,000 +	94,196	94,426	95,848	96,078	38,996	39,226	40,648	40,878
All Classes	12,370	13,495	14,022	15,147	2,959	4,083	4,611	5,735

TABLE A.2

AVERAGED BASIC DATA BY ECONOMIC CLASS AND CENSUS DIVISION

Census Division 9

Economic Class	G	G_L	G_K	G_{LK}	N	N_L	N_K	N_{LK}
250 - 2,499	733	2,905	2,853	5,025	- 488	1,684	1,632	3,804
2,500 - 4,999	3,174	6,081	5,294	8,201	-1,024	1,883	1,095	4,003
5,000 - 9,999	6,446	7,434	8,566	9,544	-1,229	- 240	891	1,880
10,000 -14,999	10,044	10,044	12,164	12,164	-2,557	-2,557	- 437	- 437
15,000 -24,999	16,071	17,737	18,191	19,857	-1,197	470	923	2,589
25,000 -49,999	29,331	30,515	31,451	32,635	2,976	4,160	5,095	6,279
50,000 +	79,717	79,772	81,837	81,892	-7,765	-7,710	-5,647	-5,592
All Classes	15,871	17,308	17,991	19,428	-1,399	38	720	2,158

Census Division 10

Economic Class	G	G_L	G_K	G_{LK}	N	N_L	N_K	N_{LK}
250 - 2,499	1,161	3,256	2,310	4,405	-1,273	822	- 124	1,971
2,500 - 4,999	3,177	4,363	4,326	5,512	- 826	359	323	1,508
5,000 - 9,999	6,234	6,854	7,383	8,003	309	929	1,458	2,078
10,000 -14,999	10,388	10,748	11,537	11,897	1,919	2,278	3,068	3,427
15,000 -24,999	16,397	16,753	17,546	17,902	3,611	3,967	4,760	5,116
25,000 -49,999	28,466	28,701	29,615	29,850	9,248	9,482	10,397	10,631
50,000 +	80,688	80,912	81,837	82,061	34,195	34,419	35,344	35,568
All Classes	8,602	9,558	9,751	10,707	1,359	2,315	2,508	3,464

TABLE A.2

AVERAGED BASIC DATA BY ECONOMIC CLASS AND CENSUS DIVISION

Census Division 11

Economic Class	G	G_L	G_K	G_{LK}	N	N_L	N_K	N_{LK}
250 - 2,499	1,040	3,972	2,281	5,213	-1,660	1,272	- 419	2,513
2,500 - 4,999	3,128	5,072	4,369	6,313	-1,156	788	85	2,029
5,000 - 9,999	6,181	7,304	7,422	8,545	- 69	1,053	1,172	2,294
10,000 -14,999	10,434	11,147	11,675	12,388	1,297	2,011	2,538	3,252
15,000 -24,999	16,393	16,999	17,634	18,240	2,979	3,586	4,220	4,827
25,000 -49,999	29,042	29,407	30,283	30,648	6,717	7,082	7,958	8,323
50,000 +	87,851	88,352	89,092	89,593	14,210	14,711	15,451	15,952
All Classes	9,290	10,917	10,531	12,158	558	2,185	1,799	3,426

Census Division 12

Economic Class	G	G_L	G_K	G_{LK}	N	N_L	N_K	N_{LK}
250 - 2,499	1,089	3,107	1,855	3,873	-1,174	844	- 408	1,610
2,500 - 4,999	3,152	4,386	3,918	5,152	- 851	383	- 85	1,149
5,000 - 9,999	6,066	6,714	6,832	7,480	342	990	1,108	1,756
10,000 -14,999	10,346	10,745	11,112	11,511	1,745	2,143	2,511	2,909
15,000 -24,999	15,919	16,363	16,685	17,129	3,631	4,076	4,397	4,842
25,000 -49,999	27,805	28,071	28,571	28,837	7,025	7,291	7,791	8,057
50,000 +	74,135	74,207	74,901	74,973	36,041	36,113	36,807	36,879
All Classes	5,733	6,898	6,499	7,664	311	1,477	1,077	2,243

TABLE A.2

AVERAGED BASIC DATA BY ECONOMIC CLASS AND CENSUS DIVISION

Census Division 13

Economic Class	G	G_L	G_K	G_{LK}	N	N_L	N_K	N_{LK}
250 - 2,499	1,114	3,218	2,100	4,204	-1,198	906	- 212	1,892
2,500 - 4,999	3,159	4,430	4,145	5,416	- 749	522	237	1,508
5,000 - 9,999	6,116	6,984	7,102	7,970	445	1,313	1,431	2,299
10,000 -14,999	10,363	10,836	11,349	11,822	2,260	2,733	3,246	3,719
15,000 -24,999	16,007	16,344	16,993	17,330	3,995	4,333	4,981	5,319
25,000 -49,999	29,312	29,611	30,298	30,597	10,271	10,571	11,257	11,557
50,000 +	84,679	85,254	85,665	86,240	36,796	37,372	37,782	38,358
All Classes	7,387	8,572	8,373	9,558	1,127	2,312	2,113	3,298

Census Division 14

Economic Class	G	G_L	G_K	G_{LK}	N	N_L	N_K	N_{LK}
250 - 2,499	989	3,552	1,586	4,149	-1,432	1,131	- 835	1,728
2,500 - 4,999	3,149	4,611	3,746	5,208	- 397	1,065	200	1,662
5,000 - 9,999	6,046	7,069	6,643	7,666	539	1,562	1,136	2,159
10,000 -14,999	10,330	10,714	10,927	11,311	2,294	2,679	2,891	3,276
15,000 -24,999	15,999	16,468	16,598	17,065	3,453	3,922	4,050	4,519
25,000 -49,999	28,796	29,289	29,393	29,886	9,241	9,735	9,838	10,332
50,000 +	66,552	66,552	67,149	67,149	16,128	16,128	16,725	16,725
All Classes	4,474	6,218	5,071	6,815	- 131	1,613	466	2,210

TABLE A.2

AVERAGED BASIC DATA BY ECONOMIC CLASS AND CENSUS DIVISION

Census Division 15

Economic Class	G	G_L	G_K	G_{LK}	N	N_L	N_K	N_{LK}
250 - 2,499	1,094	3,636	1,867	4,409	-1,421	1,121	- 648	1,894
2,500 - 4,999	3,112	5,010	3,885	5,783	-1,137	761	- 364	1,534
5,000 - 9,999	6,107	7,441	6,880	8,214	- 186	1,148	587	1,921
10,000 -14,999	10,420	11,237	11,193	12,010	638	1,456	1,411	2,229
15,000 -24,999	15,961	16,662	16,734	17,435	2,539	3,240	3,312	4,013
25,000 -49,999	28,837	29,291	29,610	30,064	6,331	6,785	7,104	7,558
50,000 +	79,262	69,790	80,035	80,363	29,816	30,144	30,589	30,917
All Classes	5,786	7,511	6,559	8,284	- 239	1,486	534	2,259

Alberta

Economic Class	G	G_L	G_K	G_{LK}	N	N_L	N_K	N_{LK}
250 - 2,499	1,107	3,562	2,728	5,183	-1,382	1,073	239	2,694
2,500 - 4,999	3,161	4,734	4,781	6,355	- 976	597	644	2,218
5,000 - 9,999	6,236	7,166	7,857	8,787	138	1,068	1,759	2,689
10,000 -14,999	10,474	11,052	12,095	12,673	1,630	2,208	3,250	3,829
15,000 -24,999	16,387	16,786	18,008	18,406	3,439	3,838	5,060	5,458
25,000 -49,999	29,268	29,544	30,890	31,165	7,895	8,170	9,516	9,792
50,000 +	109,074	109,327	110,695	110,949	42,564	42,821	44,189	44,442
All Classes	12,137	13,307	13,758	9,817	2,454	3,615	4,066	5,236

TABLE A.3

PAIRED CUMULATIVE DISTRIBUTIONS OF BASIC DATA CLASSIFIED BY ECONOMIC GROUPS RANKED ACCORDING TO AVERAGE (LOW TO HIGH) AND BY CENSUS DIVISION

Census Division 1

Ranked Economic Classes	G	R	G_L	R	G_K	R	G_{LK}	R
Class 1	.72	9.82	2.20	9.82	1.79	9.82	3.06	9.82
Class 2	2.48	19.43	4.83	19.43	4.48	19.43	6.48	19.43
Class 3	10.93	42.29	14.13	42.29	14.62	42.29	17.31	42.29
Class 4	22.50	61.62	25.64	61.62	27.11	61.62	29.70	61.62
Class 5	42.57	82.63	45.06	82.63	47.29	82.63	49.30	82.63
Class 6	61.72	94.19	63.49	94.19	65.54	94.19	66.95	94.19
Class 7	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

	N	R	N_L	R	N_K	R	N_{LK}	R
Class 1	-2.31	9.82	2.00	9.61	1.48	9.82	4.13	9.61
Class 2	-3.34	19.43	4.65	19.43	3.77	19.43	8.79	19.43
Class 3	- .40	42.29	11.00	42.29	12.92	42.29	19.75	42.29
Class 4	9.99	61.62	21.38	61.62	26.10	61.62	32.63	61.62
Class 5	30.13	82.63	39.53	82.63	46.51	82.63	51.59	82.63
Class 6	48.98	94.19	56.22	94.19	63.09	94.19	66.84	94.19
Class 7	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Census Division 2

Ranked Economic Classes	G	R	G_L	R	G_K	R	G_{LK}	R
Class 1	.40	9.64	1.38	9.64	1.49	9.64	2.33	9.64
Class 2	1.66	20.06	3.28	20.06	3.82	20.06	5.20	20.06
Class 3	6.52	40.64	8.77	40.64	10.54	40.64	12.41	40.64
Class 4	12.51	55.93	14.92	55.93	17.63	55.93	19.61	55.93
Class 5	24.41	75.38	26.75	75.38	30.42	75.38	32.30	75.38
Class 6	41.09	90.57	43.01	90.57	46.92	90.57	48.44	90.57
Class 7	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

	N	R	N_L	R	N_K	R	N_{LK}	R
Class 1	-2.16	9.64	.49	10.42	1.51	9.64	3.34	10.42
Class 2	-4.00	20.06	2.19	31.00	3.48	20.06	10.47	31.00
Class 3	-4.87	40.64	3.38	40.64	9.28	40.64	14.08	40.64
Class 4	-2.29	55.93	6.82	55.93	15.81	55.93	20.93	55.93
Class 5	4.95	75.38	14.32	75.38	26.85	75.38	31.86	75.38
Class 6	14.94	90.57	23.74	90.57	38.46	90.57	42.94	90.57
Class 7	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

TABLE A.3

PAIRED CUMULATIVE DISTRIBUTIONS OF BASIC DATA CLASSIFIED BY ECONOMIC GROUPS RANKED ACCORDING TO AVERAGE (LOW TO HIGH) AND BY CENSUS DIVISION

Census Division 3

Ranked Economic Classes	G	R	G_L	R	G_K	R	G_{LK}	R
Class 1	.57	11.07	1.72	11.07	1.80	11.07	2.78	11.07
Class 2	2.22	22.98	4.27	22.98	4.67	22.98	6.38	22.98
Class 3	7.84	43.12	10.75	43.12	12.00	43.12	14.41	43.12
Class 4	15.42	59.27	18.60	59.27	20.59	59.27	23.20	59.27
Class 5	28.27	76.97	31.22	76.97	34.01	76.97	36.39	76.97
Class 6	46.87	90.93	49.23	90.93	52.06	90.93	53.94	90.93
Class 7	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
	N	R	N_L	R	N_K	R	N_{LK}	R
Class 1	-2.03	11.07	2.41	20.15	2.02	11.07	7.34	20.15
Class 2	-3.78	22.98	3.84	32.05	4.49	22.98	11.69	32.05
Class 3	-4.93	43.12	5.66	43.12	9.93	43.12	16.08	43.12
Class 4	-1.09	59.27	10.82	59.27	17.57	59.27	24.29	59.27
Class 5	6.33	76.97	18.31	76.97	28.17	76.97	34.63	76.97
Class 6	23.44	90.93	33.83	90.93	44.31	90.93	49.71	90.93
Class 7	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Census Division 4

Ranked Economic Classes	G	R	G_L	R	G_K	R	G_{LK}	R
Class 1	.70	7.47	1.47	7.47	1.49	7.47	2.15	7.47
Class 2	3.94	21.05	5.84	21.05	5.95	21.05	7.57	21.05
Class 3	16.80	48.32	19.23	48.32	20.51	48.32	22.53	48.32
Class 4	30.88	66.49	33.26	66.49	35.07	66.49	37.03	66.49
Class 5	53.37	84.95	55.12	84.95	57.09	84.95	58.50	84.95
Class 6	77.00	96.18	77.93	96.18	79.26	96.18	80.00	96.18
Class 7	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
	N	R	N_L	R	N_K	R	N_{LK}	R
Class 1	-1.77	7.47	1.17	7.47	1.30	7.47	3.06	7.47
Class 2	-3.26	21.05	4.16	21.05	4.83	21.05	9.21	21.05
Class 3	3.93	48.32	13.92	48.32	18.72	48.32	24.22	48.32
Class 4	16.82	66.49	26.81	66.49	33.36	66.49	38.70	66.49
Class 5	42.56	84.95	49.97	84.95	56.67	84.95	60.45	84.95
Class 6	70.34	96.18	74.43	96.18	78.95	96.18	80.94	96.18
Class 7	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

TABLE A.3

PAIRED CUMULATIVE DISTRIBUTIONS OF BASIC DATA CLASSIFIED BY ECONOMIC GROUPS RANKED ACCORDING TO AVERAGE (LOW TO HIGH) AND BY CENSUS DIVISION

Census Division 5

Ranked Economic Classes	G	R	G_L	R	G_K	R	G_{LK}	R
Class 1	.47	6.84	1.26	6.84	1.22	6.84	1.89	6.84
Class 2	2.10	16.44	3.59	16.44	3.79	16.44	5.06	16.44
Class 3	9.04	37.11	11.28	37.11	12.34	37.11	14.22	37.11
Class 4	19.29	55.57	21.73	55.57	23.56	55.57	25.59	55.57
Class 5	38.12	77.12	40.17	77.12	42.71	77.12	44.38	77.12
Class 6	61.70	92.53	63.07	92.53	65.34	92.53	66.43	92.53
Class 7	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

	N	R	N_L	R	N_K	R	N_{LK}	R
Class 1	-3.35	9.60	.27	9.60	1.60	9.60	3.49	9.60
Class 2	-5.70	16.44	1.52	30.27	2.76	16.44	11.41	30.27
Class 3	-9.05	37.11	2.82	37.11	8.57	37.11	14.63	37.11
Class 4	-5.58	55.57	8.13	55.57	17.77	55.57	24.47	55.57
Class 5	8.82	77.12	21.57	77.12	34.90	77.12	40.69	77.12
Class 6	38.80	92.53	47.80	92.53	59.32	92.53	63.20	92.53
Class 7	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Census Division 6

Ranked Economic Classes	G	R	G_L	R	G_K	R	G_{LK}	R
Class 1	.88	15.65	3.06	15.65	2.62	15.65	4.47	15.65
Class 2	2.99	28.53	6.32	28.53	6.00	28.53	8.80	28.53
Class 3	9.57	48.34	13.70	48.34	14.14	48.34	17.57	48.34
Class 4	17.37	62.56	21.50	62.56	22.70	62.56	26.10	62.56
Class 5	30.59	77.83	34.29	77.83	36.13	77.83	39.16	77.83
Class 6	52.44	91.61	55.06	91.61	57.06	91.61	59.15	91.61
Class 7	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

	N	R	N_L	R	N_K	R	N_{LK}	R
Class 1	-6.57	15.65	.36	12.88	1.47	15.65	4.26	12.88
Class 2	-11.85	28.53	2.64	32.70	2.77	28.53	12.00	32.70
Class 3	-14.23	48.34	5.40	48.34	8.42	48.34	18.76	48.34
Class 4	-11.08	62.56	9.54	62.56	15.57	62.56	26.04	62.56
Class 5	- .34	77.83	19.32	77.83	27.95	77.83	37.53	77.83
Class 6	24.35	91.61	39.47	91.61	48.70	91.61	55.70	91.61
Class 7	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

TABLE A.3

PAIRED CUMULATIVE DISTRIBUTIONS OF BASIC DATA CLASSIFIED BY ECONOMIC GROUPS RANKED ACCORDING TO AVERAGE (LOW TO HIGH) AND BY CENSUS DIVISION

Census Division 7

Ranked Economic Classes	G	R	G_L	R	G_K	R	G_{LK}	R
Class 1	1.02	10.97	2.61	10.97	2.19	10.97	3.55	10.97
Class 2	4.57	25.29	7.33	25.29	7.01	25.29	9.34	25.29
Class 3	17.09	51.15	20.37	51.15	21.10	51.15	23.82	51.15
Class 4	31.46	68.97	34.63	68.97	35.88	68.97	34.48	68.97
Class 5	52.80	86.06	55.12	86.06	56.72	86.06	58.59	86.06
Class 6	74.13	95.70	75.42	95.70	76.67	95.70	77.70	95.70
Class 7	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

	N	R	N_L	R	N_K	R	N_{LK}	R
Class 1	-3.60	10.97	2.02	14.32	1.30	10.97	5.64	14.32
Class 2	-6.58	25.29	4.49	25.29	4.15	25.29	10.62	25.29
Class 3	-3.87	51.15	10.68	51.15	14.65	51.15	22.60	51.15
Class 4	6.53	68.97	21.41	68.97	27.54	68.97	35.42	68.97
Class 5	26.87	86.06	39.11	86.06	46.79	86.06	52.94	86.06
Class 6	53.66	95.70	61.57	95.69	67.81	95.70	71.62	95.69
Class 7	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Census Division 8

Ranked Economic Classes	G	R	G_L	R	G_K	R	G_{LK}	R
Class 1	1.67	18.92	5.24	18.92	3.70	18.92	6.74	18.92
Class 2	6.07	36.18	11.28	36.18	9.62	36.18	14.00	36.18
Class 3	18.39	60.40	24.07	60.40	23.34	60.40	28.03	60.40
Class 4	31.01	75.21	36.27	75.21	36.22	75.21	40.52	75.21
Class 5	47.70	87.83	51.84	87.83	52.42	87.83	55.77	87.83
Class 6	65.73	95.50	68.51	95.50	69.24	95.50	71.45	95.50
Class 7	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

	N	R	N_L	R	N_K	R	N_{LK}	R
Class 1	-7.61	18.92	3.34	17.26	1.89	18.92	7.35	17.26
Class 2	-12.14	36.18	10.09	36.18	5.17	36.18	17.61	36.18
Class 3	-6.36	60.40	19.23	60.40	17.56	60.40	31.08	60.40
Class 4	4.09	75.21	28.89	75.21	29.57	75.21	42.23	75.21
Class 5	19.54	87.83	40.99	87.83	44.01	87.83	54.48	87.83
Class 6	40.68	95.50	56.77	95.50	60.32	95.50	67.92	95.50
Class 7	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

TABLE A.3

PAIRED CUMULATIVE DISTRIBUTIONS OF BASIC DATA CLASSIFIED BY ECONOMIC GROUPS RANKED ACCORDING TO AVERAGE (LOW TO HIGH) AND BY CENSUS DIVISION

Census Division 9

Ranked Economic Classes	G	R	G_L	R	G_K	R	G_{LK}	R
Class 1	1.44	31.15	5.23	31.15	4.94	31.15	8.06	31.15
Class 2	3.41	40.98	8.68	40.98	7.83	40.98	12.21	40.98
Class 3	13.39	65.57	19.25	65.57	19.54	65.57	24.30	65.57
Class 4	17.54	72.13	23.05	72.13	23.98	72.13	28.41	72.13
Class 5	24.18	78.69	29.77	78.69	30.61	78.69	35.11	78.69
Class 6	42.36	88.52	47.11	88.52	47.80	88.52	51.63	88.52
Class 7	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

	N*	R	N_L	R	N_K	R	N_{LK}	R
Class 1	-20.92	9.84	-2316.40	11.48	-89.99	11.48	-29.74	11.48
Class 2	-10.05	40.98	-2755.41	18.03	-93.97	18.03	-30.88	18.03
Class 3	- 2.85	50.82	-2909.91	42.62	-63.53	42.62	- 9.45	42.62
Class 4	2.75	57.38	-2829.31	49.18	-55.13	49.13	- 1.59	49.18
Class 5	24.34	81.97	-1456.22	80.33	-40.17	59.02	53.32	80.33
Class 6	36.33	88.52	- 971.29	90.16	30.40	90.16	71.57	90.16
Class 7	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Census Division 10

Ranked Economic Classes	G	R	G_L	R	G_K	R	G_{LK}	R
Class 1	2.83	20.97	7.14	20.97	4.97	20.97	8.63	20.97
Class 2	10.42	41.52	16.52	41.52	14.08	41.52	19.20	41.52
Class 3	30.47	69.18	36.36	69.18	35.03	69.18	39.88	69.18
Class 4	47.21	83.04	51.95	83.04	51.43	83.04	55.29	83.04
Class 5	66.49	93.16	69.68	93.16	69.63	93.16	72.19	93.16
Class 6	83.22	98.21	84.86	98.21	84.99	98.21	86.29	98.21
Class 7	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

	N	R	N_L	R	N_K	R	N_{LK}	R
Class 1	-19.64	20.97	3.19	20.55	-1.03	20.97	8.95	20.55
Class 2	-32.13	41.52	10.63	41.52	1.61	41.52	20.88	41.52
Class 3	-25.84	69.18	21.74	69.18	17.69	69.18	37.47	69.18
Class 4	- 6.27	83.04	35.38	83.04	34.64	83.04	51.18	83.04
Class 5	20.59	93.16	52.70	93.16	53.83	93.16	66.12	93.16
Class 6	54.99	98.21	73.41	98.21	74.79	98.21	81.63	98.21
Class 7	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

*Overall net losses. Inequality is measured in terms of inequality of losses.

TABLE A.3

PAIRED CUMULATIVE DISTRIBUTIONS OF BASIC DATA CLASSIFIED BY ECONOMIC GROUPS RANKED ACCORDING TO AVERAGE (LOW TO HIGH) AND BY CENSUS DIVISION

Census Division 11

Ranked Economic Classes	G	R	G_L	R	G_K	R	G_{LK}	R
Class 1	3.21	28.69	10.44	28.69	6.21	28.69	12.30	28.69
Class 2	9.42	47.13	19.01	47.13	13.87	47.13	21.88	47.13
Class 3	23.90	68.90	33.57	68.90	29.21	68.90	37.17	68.90
Class 4	36.77	80.35	45.26	80.35	41.90	80.35	48.85	80.35
Class 5	55.61	91.03	61.89	91.03	59.78	91.03	64.86	91.03
Class 6	75.59	97.42	79.11	97.42	78.16	97.42	80.98	97.42
Class 7	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

	N	R	N_L	R	N_K	R	N_{LK}	R
Class 1	- 85.30	28.69	6.66	18.45	-6.69	28.69	10.93	18.45
Class 2	-123.48	47.13	17.14	40.21	-5.81	47.13	25.50	40.21
Class 3	-126.19	68.90	33.84	68.90	8.35	68.90	46.54	68.90
Class 4	- 99.58	80.35	44.38	80.35	24.51	80.35	57.41	80.35
Class 5	- 42.62	91.03	61.90	91.03	49.55	91.03	72.45	91.03
Class 6	34.31	97.42	82.62	97.42	77.83	97.42	87.98	97.42
Class 7	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Census Division 12

Ranked Economic Classes	G	R	G_L	R	G_K	R	G_{LK}	R
Class 1	6.04	31.78	14.31	31.78	9.07	31.78	16.06	31.78
Class 2	18.22	53.95	28.40	53.95	22.43	53.95	30.96	53.95
Class 3	47.99	82.08	55.79	82.08	52.01	82.08	58.42	82.08
Class 4	66.15	92.14	71.46	92.14	69.21	92.14	73.52	92.14
Class 5	80.03	97.14	83.31	97.14	82.04	97.14	84.70	97.14
Class 6	90.24	99.25	91.88	99.25	91.31	99.25	92.62	99.25
Class 7	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

	N	R	N_L	R	N_K	R	N_{LK}	R
Class 1	-119.98	31.78	5.75	22.16	-12.07	31.78	11.35	22.16
Class 2	-180.60	53.95	23.90	53.95	-13.83	53.95	34.16	53.95
Class 3	-149.71	82.08	42.76	82.08	15.11	82.08	56.19	82.08
Class 4	- 93.90	92.14	57.36	92.14	38.56	92.14	69.24	92.14
Class 5	- 34.96	97.14	71.16	97.14	58.98	97.14	80.03	97.14
Class 6	12.90	99.25	81.55	99.25	74.22	99.25	87.60	99.25
Class 7	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

TABLE A.3

PAIRED CUMULATIVE DISTRIBUTIONS OF BASIC DATA CLASSIFIED BY ECONOMIC GROUPS RANKED ACCORDING TO AVERAGE (LOW TO HIGH) AND BY CENSUS DIVISION

Census Division 13

Ranked Economic Classes	G	R	G_L	R	G_K	R	G_{LK}	R
Class 1	4.08	27.05	10.16	27.05	6.79	27.05	11.90	27.05
Class 2	13.77	49.71	21.87	49.71	18.01	49.71	24.74	49.71
Class 3	35.79	76.31	43.54	76.31	40.57	76.31	46.92	76.31
Class 4	51.00	87.15	57.24	87.15	55.26	87.15	60.32	87.15
Class 5	68.31	95.14	72.47	95.14	71.47	95.14	74.81	95.14
Class 6	81.06	98.35	83.57	98.35	83.10	98.35	85.09	98.35
Class 7	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

	N	R	N_L	R	N_K	R	N_{LK}	R
Class 1	-28.76	27.05	5.12	22.66	-2.70	27.05	10.36	22.66
Class 2	-43.84	49.71	15.72	49.71	- .16	49.71	25.88	49.71
Class 3	-33.33	76.31	30.83	76.31	17.86	76.31	44.43	76.31
Class 4	-11.59	87.15	43.64	87.15	34.51	87.15	56.65	87.15
Class 5	16.74	95.14	58.61	95.14	53.34	95.14	69.53	95.14
Class 6	46.04	98.35	73.30	98.35	70.46	98.35	80.79	98.35
Class 7	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Census Division 14

Ranked Economic Classes	G	R	G_L	R	G_K	R	G_{LK}	R
Class 1	9.89	44.71	25.54	44.71	13.99	44.71	27.22	44.71
Class 2	26.91	68.89	43.47	68.89	31.85	68.89	45.70	68.89
Class 3	52.95	88.16	65.38	88.16	57.09	88.16	67.37	88.16
Class 4	65.16	93.45	74.49	93.45	68.49	93.45	76.15	93.45
Class 5	82.27	98.24	87.17	98.24	84.15	98.24	88.13	98.24
Class 6	88.76	99.25	91.91	99.25	89.99	99.25	92.55	99.25
Class 7	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

	N^*	R	N_L	R	N_K	R	N_{LK}	R
Class 1	- 93.38	.76	15.96	24.18	-79.88	44.71	18.19	24.18
Class 2	-164.73	1.76	47.29	68.89	-69.47	68.89	53.13	68.89
Class 3	-291.37	6.55	65.95	88.16	-22.57	88.16	71.95	88.16
Class 4	-384.35	11.84	74.73	93.45	10.18	93.45	79.79	93.45
Class 5	-463.97	31.11	86.37	98.24	51.69	98.24	89.57	98.24
Class 6	-390.47	55.29	92.45	99.25	72.92	99.25	94.28	99.25
Class 7	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

*Overall net losses. Inequality is measured in terms of inequality of losses.

TABLE A.3

PAIRED CUMULATIVE DISTRIBUTIONS OF BASIC DATA CLASSIFIED BY ECONOMIC GROUPS RANKED ACCORDING TO AVERAGE (LOW TO HIGH) AND BY CENSUS DIVISION

Census Division 15

Ranked Economic Classes	G	R	G_L	R	G_K	R	G_{LK}	R
Class 1	5.90	31.22	15.11	31.22	8.89	31.22	16.62	31.22
Class 2	18.47	54.58	30.69	54.58	22.72	54.58	32.92	54.58
Class 3	45.86	80.53	56.41	80.53	49.94	80.53	58.66	80.53
Class 4	64.22	90.73	71.66	90.73	67.34	90.73	73.44	90.73
Class 5	82.70	97.43	86.52	97.43	84.44	97.43	87.54	97.43
Class 6	92.95	99.49	94.55	99.49	93.72	99.49	95.01	99.49
Class 7	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

	N*	R	N_L	R	N_K	R	N_{LK}	R
Class 1	- 64.24	.51	11.96	23.36	-37.89	31.22	15.86	23.36
Class 2	-118.80	2.57	35.51	54.58	-53.83	54.58	42.04	54.58
Class 3	-190.05	9.27	55.56	80.53	-25.33	80.53	64.11	80.53
Class 4	-217.30	19.47	65.55	90.73	1.61	90.73	74.17	90.73
Class 5	-197.05	45.42	80.16	97.43	43.16	97.43	86.07	97.43
Class 6	- 85.81	68.78	89.56	99.49	70.54	99.49	92.96	99.49
Class 7	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Alberta

Ranked Economic Classes	G	R	G_L	R	G_K	R	G_{LK}	R
Class 1	1.89	20.73	5.55	20.73	4.11	20.73	7.43	20.73
Class 2	6.46	38.27	11.79	38.27	10.21	38.27	19.89	38.27
Class 3	18.93	62.54	24.86	62.54	24.07	62.54	30.55	62.54
Class 4	30.70	76.18	36.19	76.18	36.06	76.18	40.52	76.18
Class 5	47.47	88.60	51.86	88.60	52.32	88.60	53.47	88.60
Class 6	65.77	96.19	68.71	96.19	69.36	96.19	67.66	96.19
Class 7	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

	N	R	N_L	R	N_K	R	N_{LK}	R
Class 1	-11.71	20.73	2.90	17.54	1.22	20.73	7.43	17.54
Class 2	-18.71	38.27	10.07	48.81	4.00	38.27	19.89	48.81
Class 3	-17.34	62.54	16.22	62.54	14.50	62.54	30.55	62.54
Class 4	- 8.25	76.18	24.55	76.18	25.42	76.18	40.52	76.18
Class 5	9.20	88.60	37.74	88.60	40.88	88.60	53.47	88.60
Class 6	33.69	96.19	54.89	96.19	58.63	96.19	67.66	96.19
Class 7	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

*Overall net losses. Inequality is measured in terms of inequality of losses.

APPENDIX B

TABLE B.1

SELECTED ECONOMIC CHARACTERISTICS OF CENSUS FARMS
BY ECONOMIC CLASS AND CENSUS DIVISION
CENSUS DIVISION 1

Economic Characteristics	Unit	250- 2,499	2,500- 4,999	5,000- 9,999	10,000- 14,999	15,000- 24,999	25,000- 49,999	50,000+
Average Farm Size	acres	338	575	975	1,349	1,893	3,175	11,684
Improved Area/Farm Area	%	17	54	58	51	51	38	13
Livestock Sales/Total Sales	%	26	31	38	49	47	53	75
Grain Sales/Total Sales	%	59	60	54	43	44	34	10
Dairy Sales/Total Sales	%	2	1	1	1	1	2	1
Other/Total Sales	%	13	8	7	7	8	11	14
Cattle Sales/Livestock Sales	%	76	88	88	91	93	93	96
Poultry Sales/Livestock Sales	%	4	3	-	-	-	3	-
Hog Sales/Livestock Sales	%	10	8	9	7	5	3	3
Wheat Sales/Grain Sales	%	87	79	78	76	71	68	69
Oats Sales/Grain Sales	%	2	2	2	2	2	3	-
Other Crop Sales/Grain Sales	%	11	19	20	22	27	29	31
Total Farm Expenses/ Total Sales	-	1.95	1.17	.90	.74	.75	.71	.61

TABLE B.1

SELECTED ECONOMIC CHARACTERISTICS OF CENSUS FARMS
BY ECONOMIC CLASS AND CENSUS DIVISION
CENSUS DIVISION 2

Economic Characteristics	Unit	250-2,499	2,500-4,999	5,000-9,999	10,000-14,999	15,000-24,999	25,000-49,999	50,000+
Average Farm Size	acres	136	303	496	637	897	1,541	3,035
Improved Area/Farm Area	%	80	80	76	79	73	60	52
Livestock Sales/Total Sales	%	41	37	39	41	44	49	81
Grain Sales/Total Sales	%	38	46	44	40	35	29	8
Dairy Sales/Total Sales	%	3	2	1	2	2	4	2
Other/Total Sales	%	18	15	16	17	19	18	9
Cattle Sales/Livestock Sales	%	67	70	76	82	80	82	92
Poultry Sales/Livestock Sales	%	1	-	-	1	-	2	2
Hog Sales/Livestock Sales	%	23	22	20	16	18	14	3
Wheat Sales/Grain Sales	%	67	61	61	58	59	61	65
Oats Sales/Grain Sales	%	5	4	4	3	2	3	4
Other Crop Sales/Grain Sales	%	28	35	35	38	39	36	31
Total Farm Expenses/Total Sales	-	2.61	1.43	1.05	.87	.82	.82	.57

TABLE B.1

SELECTED ECONOMIC CHARACTERISTICS OF CENSUS FARMS
BY ECONOMIC CLASS AND CENSUS DIVISION
CENSUS DIVISION 3

Economic Characteristics	Unit	250-2,499	2,500-4,999	5,000-9,999	10,000-14,999	15,000-24,999	25,000-49,999	50,000+
Average Farm Size	acres	246	410	633	874	1,199	1,723	4,502
Improved Area/Farm Area	%	43	54	58	56	53	51	44
Livestock Sales/Total Sales	%	53	58	59	66	68	71	82
Grain Sales/Total Sales	%	34	35	35	29	27	23	12
Dairy Sales/Total Sales	%	2	3	2	2	2	3	1
Other/Total Sales	%	11	4	4	3	3	3	5
Cattle Sales/Livestock Sales	%	77	85	86	86	88	88	91
Poultry Sales/Livestock Sales	%	1	-	-	1	-	1	2
Hog Sales/Livestock Sales	%	10	8	9	9	7	8	4
Wheat Sales/Grain Sales	%	54	56	55	57	54	51	55
Oats Sales/Grain Sales	%	6	4	2	2	4	4	4
Other Crop Sales/Grain Sales	%	40	40	43	41	42	46	41
Total Farm Expenses/Total Sales	-	2.07	1.32	1.06	.85	.83	.73	.57

TABLE B.1

SELECTED ECONOMIC CHARACTERISTICS OF CENSUS FARMS
BY ECONOMIC CLASS AND CENSUS DIVISION
CENSUS DIVISION 4

Economic Characteristics	Unit	250-2,499	2,500-4,999	5,000-9,999	10,000-14,999	15,000-24,999	25,000-49,999	50,000+
Average Farm Size	acres	512	1,050	1,531	2,265	3,405	6,064	12,420
Improved Area/Farm Area	%	51	45	45	40	34	25	23
Livestock Sales/Total Sales	%	28	34	49	53	62	72	83
Grain Sales/Total Sales	%	63	58	46	42	34	26	14
Dairy Sales/Total Sales	%	1	1	1	1	1	-	-
Other/Total Sales	%	8	7	4	4	3	2	3
Cattle Sales/Livestock Sales	%	88	87	93	96	97	98	92
Poultry Sales/Livestock Sales	%	1	1	-	-	-	-	1
Hog Sales/Livestock Sales	%	8	8	5	4	2	1	4
Wheat Sales/Grain Sales	%	90	90	89	87	86	86	90
Oats Sales/Grain Sales	%	2	1	1	1	2	3	1
Other Crop Sales/Grain Sales	%	8	9	10	12	13	12	9
Total Farm Expenses/Total Sales	-	1.68	1.12	.85	.76	.69	.69	.65

TABLE B.1

SELECTED ECONOMIC CHARACTERISTICS OF CENSUS FARMS
BY ECONOMIC CLASS AND CENSUS DIVISION
CENSUS DIVISION 5

Economic Characteristics	Unit	250-2,499	2,500-4,999	5,000-9,999	10,000-14,999	15,000-24,999	25,000-49,999	50,000+
Average Farm Size	acres	264	436	667	902	1,146	1,649	2,926
Improved Area/Farm Area	%	73	82	82	79	83	77	68
Livestock Sales/Total Sales	%	29	26	30	35	37	50	78
Grain Sales/Total Sales	%	61	68	64	61	59	46	19
Dairy Sales/Total Sales	%	2	1	1	1	1	1	2
Other/Total Sales	%	8	5	5	3	3	3	1
Cattle Sales/Livestock Sales	%	59	70	75	73	76	81	84
Poultry Sales/Livestock Sales	%	1	2	1	1	1	3	6
Hog Sales/Livestock Sales	%	32	24	19	23	19	14	7
Wheat Sales/Grain Sales	%	73	66	58	56	53	51	54
Oats Sales/Grain Sales	%	4	2	3	3	2	3	2
Other Crop Sales/Grain Sales	%	23	31	38	41	45	46	44
Total Farm Expenses/Total Sales	-	2.08	1.44	1.10	.93	.83	.73	.65

TABLE B.1

SELECTED ECONOMIC CHARACTERISTICS OF CENSUS FARMS
BY ECONOMIC CLASS AND CENSUS DIVISION
CENSUS DIVISION 6

Economic Characteristics	Unit	250-2,499	2,500-4,999	5,000-9,999	10,000-14,999	15,000-24,999	25,000-49,999	50,000+
Average Farm Size	acres	179	318	440	593	821	1,121	2,214
Improved Area/Farm Area	%	53	63	69	71	68	66	57
Livestock Sales/Total Sales	%	60	61	63	63	62	66	85
Grain Sales/Total Sales	%	22	29	29	28	28	20	8
Dairy Sales/Total Sales	%	4	3	4	6	7	11	3
Other/Total Sales	%	14	7	4	3	3	3	4
Cattle Sales/Livestock Sales	%	67	78	78	82	81	87	87
Poultry Sales/Livestock Sales	%	2	-	1	1	1	-	7
Hog Sales/Livestock Sales	%	17	13	16	14	16	11	4
Wheat Sales/Grain Sales	%	20	23	28	27	29	27	32
Oats Sales/Grain Sales	%	11	9	7	6	6	6	5
Other Crop Sales/Grain Sales	%	69	68	65	67	65	67	63
Total Farm Expenses/Total Sales	-	2.75	1.59	1.09	.90	.81	.73	.63

TABLE B.1

SELECTED ECONOMIC CHARACTERISTICS OF CENSUS FARMS
BY ECONOMIC CLASS AND CENSUS DIVISION
CENSUS DIVISION 7

Economic Characteristics	Unit	250-2,499	2,500-4,999	5,000-9,999	10,000-14,999	15,000-24,999	25,000-49,999	50,000+
Average Farm Size	acres	317	540	756	1,060	1,401	2,057	2,748
Improved Area/Farm Area	%	62	63	63	63	61	61	62
Livestock Sales/Total Sales	%	32	41	51	56	60	68	84
Grain Sales/Total Sales	%	58	50	40	37	34	27	14
Dairy Sales/Total Sales	%	3	4	4	4	3	3	1
Other/Total Sales	%	7	5	5	3	3	2	1
Cattle Sales/Livestock Sales	%	68	80	80	82	83	89	92
Poultry Sales/Livestock Sales	%	1	-	-	-	-	-	1
Hog Sales/Livestock Sales	%	25	18	18	17	16	11	6
Wheat Sales/Grain Sales	%	74	71	69	66	62	61	64
Oats Sales/Grain Sales	%	6	5	5	3	3	3	3
Other Crop Sales/Grain Sales	%	20	24	27	31	35	36	33
Total Farm Expenses/Total Sales	-	1.93	1.22	.94	.81	.75	.67	.53

TABLE B.1

SELECTED ECONOMIC CHARACTERISTICS OF CENSUS FARMS
BY ECONOMIC CLASS AND CENSUS DIVISION
CENSUS DIVISION 8

Economic Characteristics	Unit	250-2,499	2,500-4,999	5,000-9,999	10,000-14,999	15,000-24,999	25,000-49,999	50,000+
Average Farm Size	acres	206	307	429	567	689	856	1,241
Improved Area/Farm Area	%	56	63	68	69	74	75	84
Livestock Sales/Total Sales	%	54	61	66	68	71	74	84
Grain Sales/Total Sales	%	28	27	20	19	17	14	7
Dairy Sales/Total Sales	%	6	8	10	11	10	10	5
Other/Total Sales	%	12	4	4	2	2	2	4
Cattle Sales/Livestock Sales	%	70	75	74	74	72	73	85
Poultry Sales/Livestock Sales	%	1	-	-	-	-	-	1
Hog Sales/Livestock Sales	%	20	21	23	24	26	26	14
Wheat Sales/Grain Sales	%	14	15	14	16	13	10	13
Oats Sales/Grain Sales	%	10	8	6	6	5	8	5
Other Crop Sales/Grain Sales	%	75	77	80	79	82	82	83
Total Farm Expenses/Total Sales	-	2.09	1.25	.89	.80	.78	.72	.59

TABLE B.1

SELECTED ECONOMIC CHARACTERISTICS OF CENSUS FARMS
BY ECONOMIC CLASS AND CENSUS DIVISION
CENSUS DIVISION 9

Economic Characteristics	Unit	250-2,499	2,500-4,999	5,000-9,999	10,000-14,999	15,000-24,999	25,000-49,999	50,000+
Average Farm Size	acres	182	926	1,438	2,373	3,770	6,135	14,954
Improved Area/Farm Area	%	17	9	9	10	5	7	42
Livestock Sales/Total Sales	%	72	79	91	99	79	97	100
Grain Sales/Total Sales	%	-	5	-	-	-	3	-
Dairy Sales/Total Sales	%	2	-	3	-	-	-	-
Other/Total Sales	%	26	16	6	1	21	-	-
Cattle Sales/Livestock Sales	%	89	80	91	100	100	100	100
Poultry Sales/Livestock Sales	%	-	-	-	-	-	-	-
Hog Sales/Livestock Sales	%	3	10	1	-	-	-	-
Wheat Sales/Grain Sales	%	-	91	-	-	-	10	-
Oats Sales/Grain Sales	%	-	9	-	-	-	16	-
Other Crop Sales/Grain Sales	%	-	-	-	-	-	14	-
Total Farm Expenses/Total Sales	-	1.67	1.32	1.19	1.25	1.07	.90	1.10

TABLE B.1

SELECTED ECONOMIC CHARACTERISTICS OF CENSUS FARMS
BY ECONOMIC CLASS AND CENSUS DIVISION
CENSUS DIVISION 10

Economic Characteristics	Unit	250-2,499	2,500-4,999	5,000-9,999	10,000-14,999	15,000-24,999	25,000-49,999	50,000+
Average Farm Size	acres	137	389	557	755	978	1,265	1,963
Improved Area/Farm Area	%	72	74	73	71	71	70	73
Livestock Sales/Total Sales	%	33	45	56	61	65	73	83
Grain Sales/Total Sales	%	55	42	32	28	26	20	12
Dairy Sales/Total Sales	%	5	8	9	8	7	5	3
Other/Total Sales	%	7	5	3	3	2	2	2
Cattle Sales/Livestock Sales	%	68	69	68	71	74	76	80
Poultry Sales/Livestock Sales	%	1	1	1	1	1	3	9
Hog Sales/Livestock Sales	%	27	27	29	27	24	18	10
Wheat Sales/Grain Sales	%	63	60	59	55	51	51	52
Oats Sales/Grain Sales	%	9	8	6	6	5	6	4
Other Crop Sales/Grain Sales	%	28	32	35	38	43	43	44
Total Farm Expenses/Total Sales	-	2.10	1.26	.95	.81	.78	.68	.58

TABLE B.1

SELECTED ECONOMIC CHARACTERISTICS OF CENSUS FARMS
BY ECONOMIC CLASS AND CENSUS DIVISION
CENSUS DIVISION 11

Economic Characteristics	Unit	250- 2,499	2,500- 4,999	5,000- 9,999	10,000- 14,999	15,000- 24,999	25,000- 49,999	50,000+
Average Farm Size	acres	210	303	396	484	538	636	1,051
Improved Area/Farm Area	%	60	69	75	77	81	84	80
Livestock Sales/Total Sales	%	51	59	60	60	54	50	74
Grain Sales/Total Sales	%	32	25	22	18	14	9	6
Dairy Sales/Total Sales	%	7	10	14	19	28	35	8
Other/Total Sales	%	10	6	4	3	4	6	12
Cattle Sales/Livestock Sales	%	67	68	61	62	62	67	63
Poultry Sales/Livestock Sales	%	1	1	1	1	2	6	14
Hog Sales/Livestock Sales	%	23	26	34	32	30	22	14
Wheat Sales/Grain Sales	%	20	23	21	21	20	23	16
Oats Sales/Grain Sales	%	22	18	15	14	15	17	20
Other Crop Sales/Grain Sales	%	58	59	64	64	65	60	64
Total Farm Expenses/Total Sales	-	2.60	1.37	1.01	.88	.82	.77	.84

TABLE B.1

SELECTED ECONOMIC CHARACTERISTICS OF CENSUS FARMS
BY ECONOMIC CLASS AND CENSUS DIVISION
CENSUS DIVISION 12

Economic Characteristics	Unit	250-2,499	2,500-4,999	5,000-9,999	10,000-14,999	15,000-24,999	25,000-49,999	50,000+
Average Farm Size	acres	367	569	709	905	1,161	1,556	2,927
Improved Area/Farm Area	%	46	50	55	56	56	51	48
Livestock Sales/Total Sales	%	49	62	68	69	71	79	87
Grain Sales/Total Sales	%	35	24	21	16	15	12	8
Dairy Sales/Total Sales	%	5	8	7	9	9	6	-
Other/Total Sales	%	11	6	4	6	5	3	5
Cattle Sales/Livestock Sales	%	73	71	65	63	61	69	66
Poultry Sales/Livestock Sales	%	1	1	-	-	-	-	3
Hog Sales/Livestock Sales	%	23	28	34	35	35	29	30
Wheat Sales/Grain Sales	%	44	49	46	45	44	41	36
Oats Sales/Grain Sales	%	9	6	6	4	6	5	5
Other Crop Sales/Grain Sales	%	48	45	48	51	50	55	60
Total Farm Expenses/Total Sales	-	2.08	1.27	.94	.83	.77	.75	.51

TABLE B.1

SELECTED ECONOMIC CHARACTERISTICS OF CENSUS FARMS
BY ECONOMIC CLASS AND CENSUS DIVISION
CENSUS DIVISION 13

Economic Characteristics	Unit	250-2,499	2,500-4,999	5,000-9,999	10,000-14,999	15,000-24,999	25,000-49,999	50,000+
Average Farm Size	acres	295	423	527	650	798	967	1,295
Improved Area/Farm Area	%	57	64	68	71	74	76	81
Livestock Sales/Total Sales	%	43	52	62	66	70	78	89
Grain Sales/Total Sales	%	39	31	23	20	18	14	8
Dairy Sales/Total Sales	%	6	10	10	10	9	6	2
Other/Total Sales	%	12	7	5	4	3	2	1
Cattle Sales/Livestock Sales	%	64	65	62	62	60	66	76
Poultry Sales/Livestock Sales	%	1	1	-	-	1	2	6
Hog Sales/Livestock Sales	%	29	30	35	36	38	30	17
Wheat Sales/Grain Sales	%	24	22	23	19	19	13	9
Oats Sales/Grain Sales	%	9	6	6	6	7	5	3
Other Crop Sales/Grain Sales	%	67	72	71	75	74	83	88
Total Farm Expenses/Total Sales	-	2.08	1.24	.93	.78	.75	.65	.57

TABLE B.1

SELECTED ECONOMIC CHARACTERISTICS OF CENSUS FARMS
BY ECONOMIC CLASS AND CENSUS DIVISION
CENSUS DIVISION 14

Economic Characteristics	Unit	250-2,499	2,500-4,999	5,000-9,999	10,000-14,999	15,000-24,999	25,000-49,999	50,000+
Average Farm Size	acres	362	552	860	823	980	1,087	3,319
Improved Area/Farm Area	%	38	43	38	57	58	65	47
Livestock Sales/Total Sales	%	62	73	72	76	76	76	87
Grain Sales/Total Sales	%	17	12	10	10	6	2	10
Dairy Sales/Total Sales	%	6	7	10	8	14	22	1
Other/Total Sales	%	15	8	8	6	4	-	2
Cattle Sales/Livestock Sales	%	76	80	71	67	70	80	79
Poultry Sales/Livestock Sales	%	1	-	1	-	-	-	4
Hog Sales/Livestock Sales	%	16	15	24	29	30	20	4
Wheat Sales/Grain Sales	%	35	25	27	63	60	-	43
Oats Sales/Grain Sales	%	18	20	31	5	13	55	1
Other Crop Sales/Grain Sales	%	48	55	41	32	27	45	56
Total Farm Expenses/Total Sales	-	2.45	1.13	.91	.78	.78	.68	.76

TABLE B.1

SELECTED ECONOMIC CHARACTERISTICS OF CENSUS FARMS

BY ECONOMIC CLASS AND CENSUS DIVISION

CENSUS DIVISION 15

Economic Characteristics	Unit	250-2,499	2,500-4,999	5,000-9,999	10,000-14,999	15,000-24,999	25,000-49,999	50,000+
Average Farm Size	acres	426	603	773	984	1,223	1,656	2,570
Improved Area/Farm Area	%	29	63	69	73	72	73	65
Livestock Sales/Total Sales	%	20	23	24	26	29	33	67
Grain Sales/Total Sales	%	57	58	58	56	50	39	19
Dairy Sales/Total Sales	%	1	1	1	1	3	6	1
Other/Total Sales	%	22	18	17	17	18	22	13
Cattle Sales/Livestock Sales	%	58	62	63	58	62	69	87
Poultry Sales/Livestock Sales	%	1	-	1	-	-	-	-
Hog Sales/Livestock Sales	%	32	31	33	37	36	26	12
Wheat Sales/Grain Sales	%	21	22	24	26	23	22	27
Oats Sales/Grain Sales	%	4	3	4	4	4	6	5
Other Crop Sales/Grain Sales	%	75	74	73	71	73	72	68
Total Farm Expenses/Total Sales	-	2.30	1.37	1.03	.94	.84	.78	.62

TABLE B.2

SELECTED ECONOMIC CHARACTERISTICS OF CENSUS FARMS BY CENSUS DIVISION

Census Division	Average Farm Size (acres)	Improved area Farm Area (%)	Breaking[a] per Operator (acres)	Weighted[b] Cost-Income ratios
1	2,015	37	1.65	.9167
2	939	65	2.68	1.0892
3	1,206	50	1.49	1.0361
4	2,794	33	3.31	.8771
5	1,084	78	.88	1.0210
6	706	64	1.91	1.2564
7	1,052	62	1.71	.9894
8	488	71	2.18	1.1239
9	3,224	26	7.94	1.3089
10	587	72	1.80	1.1977
11	383	74	2.20	1.4757
12	646	52	2.66	1.3493
13	502	68	3.30	1.2631
14	587	43	6.28	1.6331
15	704	65	6.01	1.4752

[a]Includes the omitted group and institutional farms.

[b]
$$\sum_{i=1}^{m} n_i E_k \Big/ nY_i$$

where m is the number of groups, n_i is the number of operators in the i-th group, n is the number of operators in all groups and Yi and Ei are respectively gross farm cash income and total farm expenses accruing to the i-th group.